

THE DUMPING SYNDROME AN OPERATION FOR ITS PREVENTION

BY

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The term "dumping" is applied to a syndrome that occurs in a quite high percentage of cases following gastrectomy or, less frequently, gastro-enterostomy. The symptoms occur during or on completion of a meal, and are characterized by a feeling of weakness and occasionally nausea; an unpleasant feeling of warmth all over the body; cold sweat on the face; and rapid action of the heart and often a rise in blood pressure. They last for about half an hour, and vary in severity up to the point of producing complete prostration. The condition has been the subject of intensive investigation for some years, and search for the cause has involved the exploration of such diverse possibilities as distension of the gastric stump, gastritis, hypochlorhydria and achlorhydria; toxæmia from the absorption of incompletely broken-down products, shock, and neurosis; hyperglycaemia; and jejunal distension and jejunitis.

Jejunal distension and abnormalities of carbohydrate metabolism seemed to be the most significant factors and consequently received the attention of many investigators. In their study of patients suffering from dumping ("early postprandial symptoms") Schechter and Necheles (1949) concluded that "there is probably no aetiological relationship between the early postprandial symptoms and the abnormal glucose-tolerance curves, which both occur in some patients with gastrectomy or gastro-enterostomy," and that there is no fundamental disturbance in carbohydrate metabolism in patients who manifest early postprandial symptoms or abnormal carbohydrate tolerances." In the same year the role of carbohydrate was further elucidated by the work of Machella (1949), whose conclusions agreed with the above; Machella, however, took the investigation further and found that the syndrome could be produced in a variety of healthy subjects and dumpers both by the ingestion of hypertonic solutions other than glucose and by the mechanical distension of the efferent jejunum. He noted that the presence of hypertonic solutions in the jejunum produced marked secretion from the gut, and he concluded that the dumping syndrome is caused by "distension of the jejunum . . . due to an outpouring of fluid by the jejunal wall in an attempt to dilute hypertonic food material that has been passed along by the non-retentive stomach rather than to the mechanical passage of the food *per se*. The symptoms are not caused by hypoglycaemia or hyperglycaemia, though hyperglycaemia may be present during the period of symptoms if the particular hypertonic solution responsible for their production happens to be a sugar solution such as sucrose or glucose."

It is possible that this ingenious explanation holds true in at least some of the cases; there is no doubt that the gastric remnant is non-retentive in all cases, though the degree to which it exercises this tendency varies with the type of resection performed. Custer *et al.* (1946) believed that the rapid emptying was the chief cause of the syndrome and that "the results of operation that narrow the opening of the gastric remnant have been uniformly good." They favoured the Schoemaker and Hoffmeister resection technique and thought that dumping that resulted from operation other than the Polya was likely to be temporary and

mild, a conclusion not supported by the present series. After investigation of 130 Polya gastrectomies and an extensive survey of the literature, Watson (1947) also favoured the narrow stoma: he found over 50% of dumpers in his series. Even this high figure is exceeded by Muir (1949), who, from 124 similar resections, reported 75% of dumpers. Visick (1948) noted 16% in a sequence of 500 cases. Figures from American sources average about 15%.

I investigated a personal series of 162 gastrectomies performed between April, 1945, and March, 1949; a questionnaire concerning all was filled in, most were personally interviewed, and 100% were traced. Six (3.7%) died as a direct result of operation, from the following causes: pulmonary embolus (necropsy), 2; ? acute mania (limited necropsy), 1; cachexia due to Addison's disease and gastric cancer, 1; infective jaundice in a patient with prostatism, 1; suffocation from vomit half an hour after return to bed, 1. There were eight late deaths: recurrence following resection for cancer, 3; cardiac failure, 2; stroke, 1; motor accident, 1; further operation for gastro-jejuno-colic fistula, 1.

Dumping occurred in 31 (20.9%) of the 148 survivors, and was present in severe form in 10; 3 mild cases made complete recovery, 3 described under the heading "severe" have periods when their symptoms are mild in character, and others have had remissions regardless of the type of operation performed. Most related their symptoms to bulky carbohydrate meals, some to the first meal of the day, and a few to tea or coffee. In one case the symptoms occurred only if the patient ate *plâche* or *sole*—two delicacies to which he had long been addicted. One patient thought that his present condition was no better than it was before operation, and all considered that they suffered a definite disability.

Though it would seem from reports on gastrectomy for peptic ulcer that authors do not always include even severe dumping in their list of failures, the condition is a serious challenge to the surgeon advising a procedure likely to produce it and is no less a challenge from the fact that the patient may think the new disability mild by comparison with the old. The man who suffered severe ulcer pain does not worry unduly about functional symptoms, and for that reason a brief note on the indications for operation may be of interest. In the 162 cases the diagnosis was: gastrojejunal ulcer, 10 (with pyloric stenosis, 1); duodenal ulcer, 91 (with pyloric stenosis, 20); gastric ulcer, 48 (with pyloric stenosis, 1); gastric carcinoma, 13.

Nearly all of the uncomplicated ulcers penetrated the adjacent viscera; five of the sleeve resections were performed as the only radical alternative to total gastrectomy for high and extensive gastric ulceration; the sixth was used in dealing with a giant mid-gastric ulcer in a woman of 78. All the uncomplicated ulcer cases had been referred by physicians, and a number of patients who were operated on did not proceed to resection, as the findings were not held to justify so radical a procedure. No patient was denied operation because of a statistical possibility of his death; the ages ranged between 16 and 82. The 148 survivors consisted of 115 males and 33 females; 23 males and 8 females complained of dumping.

The Table indicates the significance of the particular type of operation performed in relation to the development of the syndrome. The important points appeared to be that the Polya resection produced the highest percentage of cases, that the Schoemaker technique prevented the occurrence of dumping in severe form, and that the Hoffmeister—

Finsterer method failed to do so. In all except one of this series the symptoms began within a month of operation, and in most cases the patient first became aware of them when

Dumping Syndrome in 148 Survivors

Operation	No. of Cases	Dumping Syndrome
Hoffmeister-Finsterer ..	117	24 cases, severe symptoms in 5
Polya ..	3	3 cases, severe symptoms in 1
Sleeve resection ..	6	None
Billroth I type ..	22	4 cases, severe symptoms in none

he began to take his meals at table, after his period of post-operative recumbency. In this paper the term "severe" is used to describe those cases in which the urgency of the symptoms produced a *compelling necessity to recline*.

The rapid emptying that follows resection with gastro-jejunal link-up was confirmed by x-raying a series of cases, and though the actual rate varied from case to case it appeared that many who were symptom-free emptied just as quickly as those who were severe dumpers. In others, both with and without symptoms, there seemed to be a

therefore be due to some other effect produced by the valve. In the words of Visick, the valve cannot affect the emptying time unless "the stomach is narrowed to the point of producing actual organic obstruction," but it can, and in my view it does, affect the character of the emptying. After the Polya operation the passage of food from the oesophagus to the jejunum is unimpeded; after the Hoffmeister-Finsterer operation some of the food is deflected towards the greater curvature, with the result that it reaches the jejunum in a less precipitate manner (Fig. 1, B). It is as if in one case a bather entered a swimming-pool by diving from the board, in another by sliding down the chute.

A number of mechanisms, including the position and calibre of the pylorus, the concavity of the duodenum, and the duodeno-jejunal flexure, retard the passage of food from the stomach to the jejunum (Fig. 1, A). It is unlikely, therefore, that any resection involving gastro-jejunal anastomosis would be free of the risk of producing the dumping syndrome if the rate and character of the gastric emptying were such important factors in its causation, but the anastomosis described below should be effective in limiting its frequency and severity.

In the method to be described the stoma occupies the middle of the cut end of the stomach, the remainder being closed by an upper and a lower valve. The upper one, as in the Hoffmeister technique, tends to limit the flow of bile into the gastric remnant and to prevent the retrograde passage of food into the duodenum. The important valve is the lower one, and its function is to prevent food from passing from the oesophagus to the jejunum without a preliminary period of retention in the stomach (Fig. 1, C). Finally, the efferent loop is sutured for a distance of $\frac{1}{2}$ in. (1.25 cm.) along the greater curvature in order to produce a further effect in "easing" the food into the jejunum.

Operation

The patient comes to the theatre with a Ryle tube *in situ*; if resection is decided upon the stomach is aspirated and the tube removed. In the case of duodenal or recurrent ulcer it is considered that at least five-sixths of the stomach is removed.

Two Payr's clamps are placed across the stomach along the line chosen for anastomosis. The distal stomach is removed flush with the upper clamp but a fringe is left on the lower one.

The upper clamp is removed and the cut end of the stomach is closed with two layers of 00 chromic catgut, the end of the final layer being retained as a stay suture. The mesocolon is slit along a line extending outwards from a point about $1\frac{1}{2}$ in. (3.75 cm.) from its root. The corner corresponding with the root of the mesentery is sutured to the posterior wall of the stomach at a point opposite the tip of the Payr's clamp. Thus the mesocolon can be sutured around the gastric remnant without causing a drag on either structure. Only the posterior layer of sutures are inserted, the end ones being retained for traction; the previous stay suture is removed.

The jejunum is drawn through the mesocolic rent and sutured along the full length of the posterior cut edge of the stomach. When the line is completed the end is knotted and the single upper end and double lower end are used for traction, the previous stay suture being removed. The fringe left on the Payr's clamp is excised and the clamp removed; the edges are well sealed at this stage and do not gape. The lower half of the stoma is buried in two layers and Duval's tissue forceps are placed on the upper half.

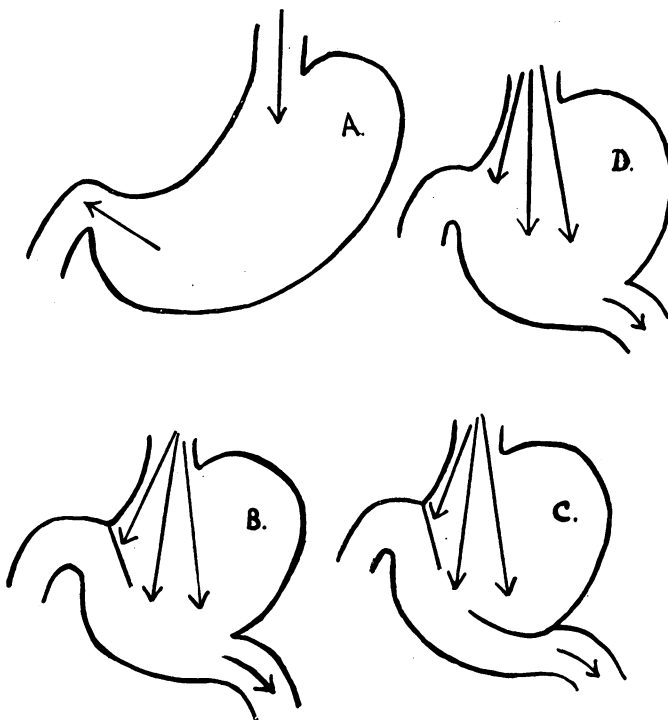


FIG. 1.—A. Course of food in normal stomach. B. Action of Hoffmeister-Finsterer in deflecting food from jejunum. C. Showing effect of double valve in preventing the precipitate discharge of food into the jejunum. D. Diagram of course of food after Polya gastrectomy.

certain amount of seesaw movement between the jejunum and the gastric remnant, as shown by the latter containing more barium after about half an hour than it did at the beginning of the meal. This phenomenon probably represents a minimal reaction of the jejunum to overloading, and is of interest in that it may occur in patients with no symptoms. Attacks of diarrhoea or vomiting occurring in gastrectomized patients are undoubtedly of similar origin and differ only in exhibiting a more severe response. The discharge into the jejunum takes place just as rapidly after the Hoffmeister-Finsterer as after the Polya operation, the barium appearing to go straight through from the oesophagus to the gut in both cases. The smaller percentage of dumpers that result from the former operation must

The operation field is packed off with sponges and an opening corresponding in size to the central gastric stoma is made in the jejunum; when making the incision in the latter structure it is important for subsequent ease of suturing that the jejunal edges deviate slightly from the gastric ones at the corners. The anastomosis is made as in Fig. 2, care being taken that the sutures on the gastric side lie proximal to the crushed edge. The original gastro-jejunal suture is continued along the anterior edge of the stomach and jejunum, and the operation is concluded with closure of the hole in the mesocolon.

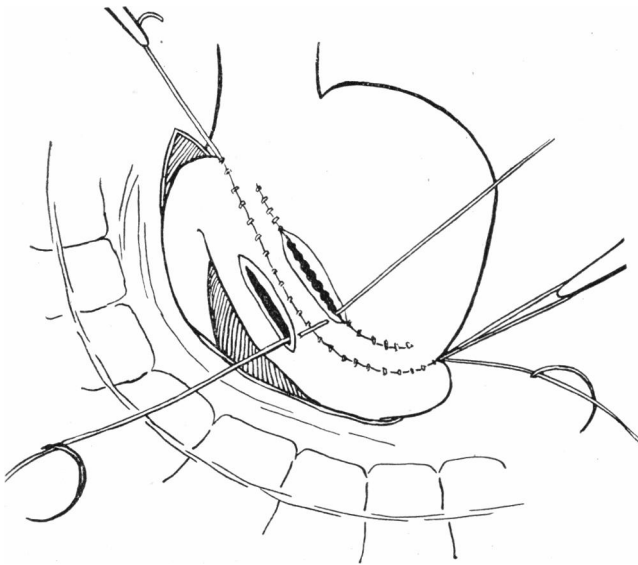


FIG. 2.—A hole has been made in the jejunum corresponding in size and position with the central gastric stoma; the first haemostatic suture is being inserted.

After the construction of the two valves the original cut end of the stomach assumes a gentle convex curve lying in a corresponding jejunal concavity. The stoma lies at a level slightly higher than the centre of the convexity and admits three crouched fingers.

Report on Cases

From April until the end of December, 1949, this type of anastomosis was employed in 50 gastric resections performed for the following conditions: duodenal ulcer, 33 (with pyloric stenosis, 15); gastric ulcer, 7; pyloric hypertrophy, 2; gastrojejunal ulcer, 5 (3 had double gastro-jejunal ulcers); carcinoma, 3.

There were 44 males and 6 females. All were traced and a questionnaire filled in concerning them; 35 were personally interviewed. There was one operative death on the second post-operative day. The operation was for a duodenal ulcer which had perforated on two previous occasions. Technically it had proved quite easy, and progress was uneventful until five hours before death, when tachycardia developed and increased to 220 (on the E.C.G.); limited exploration showed no abdominal abnormality. It is now considered that intravenous procaine might have averted this fatality. One late death occurred due to cardiac failure.

No severe dumper was found in the 48 survivors; two had moderate dumping symptoms and one complained of "occasional weakness" about two hours after meals containing carbohydrate in large amounts. Another had "slight attacks of indigestion after breakfast," another "fullness after a large meal." One man who had gained

nearly a stone (6.4 kg.) in weight complained of symptomless vomiting about once a week; an x-ray film showed no abnormality.

The pre-operative and post-operative weights had been recorded in all of the cases; 5 lost weight, 6 maintained the pre-operative weight, and the remaining 37 gained an average of 10.3 lb. (4.7 kg.) each. Examination in a few months would undoubtedly show improvement among those who had had no gain in weight. One of those who lost weight was operated on late in December and developed a duodenal fistula; the two described as suffering moderate dumping symptoms both lost weight, one of these having been operated on for advanced carcinoma. In the remaining two the weight loss averaged 5 lb. (2.3 kg.).

Comment

Only when the 148 cases had been studied did it become apparent that other functional symptoms as well as dumping were related to the character of the gastro-jejunal discharge. Owing to the limited scope of the original investigation the pre- and post-operative weights had not been recorded in the series of 148 cases, but the impression was that few, if any, who were not operated on for pyloric stenosis gained weight and that many lost it.

Post-gastrectomy syndrome, bilious vomiting, and loss of weight are the main functional symptoms that may follow gastrectomy, and in my view they all result from the pre-precipitate discharge from the gastric remnant into the jejunum. All three are often present in the same patient, though any of them may be found separately; dumping of any severity usually results in loss of weight. It is not considered that the entry of bile into the gastric remnant is the common cause of bilious vomiting. For mechanical reasons the gastric remnant is incapable of containing bile for more than a few moments, and it is unlikely that it is less tolerant of bile than is the normal stomach. Bilious vomiting is simply one type of jejunal response to overloading; the vomit may contain nothing but bile because the maximum biliary secretion happens to take place at the time of the overloading and most of the food has already been passed on by the irritable jejunum. The same jejunal irritability with its resulting increased peristalsis is the probable cause of the loss in weight.

From the point of view of functional symptoms the Billroth I type of operation is far superior to any other resection, but it is feasible in only a small number of cases that require resection. The operation above was designed to limit functional post-gastrectomy symptoms by altering the character and speed of the gastro-jejunal discharge. X-ray examination of a series of 35 cases showed that it altered the character of the emptying, and in general caused moderate prolongation of the emptying time. The early results of the procedure appear to be far better than those from other types of resection with gastro-jejunal link-up, and one of the most gratifying aspects seems to be the number of patients who gained considerably in weight within a period of two months of operation, a finding the more significant because I began to favour extensive resections only a short time before beginning to operate by the above technique.

Summary and Conclusion

Post-gastrectomy syndrome is mechanical in origin and represents one type of jejunal response to precipitate gastric emptying.

Investigation of 212 cases shows the relation between the type of anastomosis and the occurrence of the post-gastrectomy syndrome.

It is considered that other functional symptoms, such as bilious vomiting and loss of weight, are likewise the result of the jejunal response to precipitate gastric emptying; in the absence of such emptying, loss of weight is not directly related to the extent of the gastric resection.

A valvular anastomosis for gastric resection is described and its effect in reducing the incidence of functional post-gastrectomy symptoms is shown in a review of the early results in 48 cases.

My thanks are due to the house-surgeons and nurses of Sir Patrick Dun's Hospital for the care which they expended on these patients; to the staff of the x-ray department for the radiological investigations, and to Mrs. J. Henry for the operation sketches.

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THE CAUSE AND MANAGEMENT OF FAILED FORCEPS CASES

BY

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Until 1888 it was not compulsory for a student to attend any case of labour before qualifying, and even now it is necessary for him or her to spend only enough time in a maternity hospital to attend the required number of 20 cases. It is possible to do this without seeing, even less treating, any abnormality; thus the student after qualification only too often enters practice without realizing, other than in theory, the serious difficulties to be encountered.

The comprehensive study of unsuccessful forceps deliveries reveals a wide field of the difficulties encountered in practical obstetrics. The subject therefore is of considerable importance not only to the practising obstetrician but also to the medical student. Indeed, these cases may well have their medico-legal aspect, and it is the operator who must accept full responsibility should legal complications ensue.

A clear appreciation of the dangers and pitfalls arising from the abuse of forceps should be an integral part of undergraduate teaching, and instruction should be directed not only on when to apply forceps but when not to; thus the newly qualified practitioner will benefit from the mistakes of others as well as from his own.

The largest series of cases (558) reported in the literature is that by Miller (1927). This series was discussed by Fletcher Shaw (1928) and Hendry (1928) at the Annual Meeting of the British Medical Association in 1928. Smaller series have been reported by Stacey (1931), Munro Kerr (1937), Feeney (1947), and Dobbie (1948).

For the purposes of this paper the definition of failed forceps may be taken as the unsuccessful application of obstetric forceps in an attempt to effect delivery. In considering the mechanism of this failure, I find that in practice there are two indications of failure: (a) the forceps slip off the presenting part, or (b) they fail to produce descent in spite of traction.

Present Investigation

The case records of 100 patients admitted under the honorary staff of the Birmingham Maternity Hospital during the years 1941-8 have been investigated. The principal causes of failure have been divided into six groups (see Table I). There were 62 forceps deliveries, 17 spontaneous deliveries, 8 internal versions, 6 caesarean sections,

TABLE I.—Details of 100 Cases

Group	Aetiology	No. of Cases	No. of Primiparae	Foetal Deaths	Maternal Deaths
1	Occipito-posterior position	34	28	15	1
2	Deep transverse arrest	22	19	8	—
3	Cervix not fully dilated	20	11	3	—
4	Brim disproportion (normal foetus)	8	4	4	—
5	Contracted outlet (occipito-anterior)	5	4	1	1
6	Miscellaneous:				
	Hydrocephalus	4	2	4	—
	Breech presentation	1	1	—	—
	Face, mento-anterior	1	1	—	—
	Face, mento-posterior	1	1	1	—
	Brow presentation	1	—	1	—
	Contraction ring	1	1	1	—
	Vaginal septum	1	1	—	—
	Ovarian cyst	1	—	—	—
	Total	100	73	38	2

6 craniotomies, and 1 breech extraction. The third stage was normal in all cases, apart from the manual removal of the placenta on two occasions. The cases are analysed in detail, group by group, and observations are made on their management.

Group 1: Persistent Occipito-posterior Position

Method of Delivery in Hospital	No. of Cases	Babies Dead on Admission	Maternal Deaths	Foetal Deaths
Normal	1	—	—	—
Face to pubes	1	—	—	—
Manual rotation (forceps)	26	1	—	9
Internal version	4	1	1	4
Craniotomy	2	2	—	2
Total	34	4	1	15

The one death occurred from post-operative shock; version had been attempted by the patient's own doctor after his failure to deliver with forceps. Craniotomy was attempted after transfer to hospital, but the cranioclast slipped off and a baby weighing 9 lb. 3 oz. (4.2 kg.) was delivered by internal version and breech extraction. In the other three cases internal version was undertaken, after forceps had again failed in hospital, in preference to craniotomy only because the foetal heart could still be heard. Rupture of a uterus already moulded upon the foetus after an unsuccessful attempt at delivery may easily be caused by version, and its use can rarely be justified.

In 26 cases the treatment by manual rotation to the occipito-anterior position followed by the application of forceps resulted in an easy forceps delivery, with one exception. It was the failure to diagnose the posterior position rather than the inability to rotate the head that gave rise to the unsuccessful extraction: the blind application of forceps to the foetal head without first ascertaining its position is done far too often; sooner or later it leads to disaster.

In those cases in which there is some disproportion and the head moulds through the brim, with the occiput posterior, disimpaction of the head is necessary to enable it to be rotated. To do this it must be pushed up above