

# THE COMPLICATIONS OF PARTIAL GASTRECTOMY

Lecture delivered at the Royal College of Surgeons of England  
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by

F. A. R. Stammers, C.B.E., T.D., B.Sc., Ch.M., F.R.C.S.

Professor of Surgery, University of Birmingham, and Consultant Surgeon, United  
Birmingham Hospitals

IT IS ALWAYS important to study and to analyse the complications of any form of treatment since that is how one learns to circumvent them. This is especially so in gastric surgery, partial gastrectomy being as it is one of the commonest major operations of to-day.

Professor Charles Wells's (1955) excellent lecture on the later results of gastrectomy which, of course, includes late complications, has so recently been published in the *Annals of the Royal College of Surgeons* that I shall concentrate on the earlier complications and refer to the later ones only in so far as the experience of my own unit may have contributed something to the knowledge of the subject. The remarks that follow are based on an experience of just over 1,000 cases of gastrectomy carried out by myself or by my colleagues on the surgical professorial unit in Birmingham.

## INTRODUCTION

As an introduction I would like to stress that it is of paramount importance, indeed, fundamental, that prior to any operation the patient be brought into physiological balance regarding fluids, electrolytes, proteins, haemoglobin and vitamins. The majority of patients are already in perfect balance; others, particularly those with pyloric stenosis, are often seriously out of balance; but between these two extremes there are many whose imbalance is only revealed by laboratory investigations, yet in whom it is important to rectify any imbalance since they can then better withstand those fortuitous complications such as, haemorrhage, infection, lung collapse, diarrhoea, embolism, etc. It is especially important in the elderly, of whom we see more and more; indeed, it is only by insisting on this pre-operative state of physiological balance in all cases that the operative mortality rate can be brought down to two per cent. Post-operative balance, as a continuation of this policy, is even more important, and I shall therefore assume that every patient, either in the theatre or immediately on return to the ward is put on gastric suction (Ryle's tube) for 12 to 24 hours and an intravenous drip, and, most essential, that a proper fluid and electrolyte balance-chart be kept as a routine. It is quite true that many patients, especially if their pre-operative condition is good, can tolerate 2 to 3 days of starvation and low fluid intake—indeed, the body's natural metabolic response to operation is retention of water and salt—but if because of some complication it becomes necessary to withhold fluids still longer, at a time when his reserves have been

used up, the patient faces his complication at a disadvantage and this, in the elderly, the anaemic, the bronchitic, the cardio-vascular patient, may spell disaster (Stammers, 1954).

## THE COMPLICATIONS

### Haemorrhage

One of the minor advantages of gastric suction is that it enables one to know if bleeding from the suture line is occurring. The first few hourly aspirates will naturally contain a little blood, but unless it remains or becomes bright red, or is vomited or aspirated in unusual quantities, or continues for 4 to 5 days, accompanied by a rising pulse, it is very rarely necessary to interfere surgically. Personally, I have only known of three cases requiring a second operation. Keeping the patient comfortable by correct hydration, a little ice to suck and morphia, almost invariably allows the bleeding to stop.

### Excessive Aspirates and Stomal Obstruction

After the first 12 to 24 hours, and assuming that from 12 hours onwards fluids by mouth to the extent of 30 ml. (30 ml.) have been started, one does not expect each hourly aspirate to amount to more than about 60 ml. (60 ml.), the excess over intake being gastric secretion, swallowed saliva, old blood and a little lymph, yet sometimes double this quantity is obtained. This may result from the causes (i) that oedema at the stoma causes partial obstruction (and this is much more likely after the Billroth I operation than the Polya—indeed, after the former I have often seen it last 6 days, and in two cases for 12 days); and (ii) that as the tone of the gastric remnant recovers, the tip of the Ryle's (or other) tube slips through the stoma and bile and pancreatic secretions, which it will be remembered amount to about 1,000 ml. in twenty-four hours, are aspirated. The remedy is simple, namely, to withdraw the tube some 2 inches (5 cm.) perhaps checking by X-rays the position of the metal tip. If this does not reduce the size of the aspirates but, instead, they increase, it is due to stomal oedema. Provided physiological balance is maintained, it is safe to await events, and then, comparatively suddenly on about the fifth or sixth day, the aspirates fall to 1 to 2 (30 to 60 ml.) hourly. Under such circumstances it is most important by hourly aspiration to keep the stomach empty in order to prevent acute dilatation or aspiration pneumonia from regurgitation.

### Duodenal Leak or Burst

This complication is less common than hitherto, but at one time it accounted for about half the mortality rate in any series of cases. Many explanations have been offered, such as digestion of sutures, insufficiency of stitching, and gangrene of the suture line resulting from interference of blood supply when dissecting a scarred duodenum from the pancreas; and all surgeons pay great attention to this part of the operation, using

reinforcement by a third or even fourth line of sutures. However, it seems more likely that the leak or rupture follows obstruction at the stoma, either by oedema or kinking, since a hugely distended duodenum has been found in some instances at the second operation. It makes it all the more important to be sure that the stoma lies without twist or kink, and to avoid a long afferent loop. There seems good reason to believe that oedema develops more readily in the hypoproteinaemic patient, a condition that should have been discovered and corrected before operation.

### **Chests, with special reference to Pulmonary Tuberculosis**

Heavy smokers, city dwellers with their tendency to para-nasal sinus infection, and the ever increasing number of elderly people, all readily develop lung complications following anaesthetics and upper abdominal operations. A few days spent in "no-smoking," breathing exercises, physiotherapy and treatment of septic sinuses will lessen this tendency to chest trouble. It is wise to investigate for the predominant organism, and some surgeons give the appropriate antibiotic prior to operation, others leave it until afterwards. It is important to examine for active or quiescent tuberculosis, since it has been shown by a number of Centres, including Birmingham, that some quiescent cases become active again following gastrectomy, probably as a result of nutritional defects. At the end of operation and, in the event of excessive secretions, the bronchial tree should be aspirated through a bronchoscope, though not as a routine, and the lungs should be carefully and repeatedly examined after operation, remembering that in severe pulmonary collapse one should not hesitate to apply postural drainage or even bronchial suction once again, for it may save life.

Regarding the incidence of tuberculosis, the Birmingham analysis of 955 cases by Thorn and Brookes (1955), is as follows. Of the 955 cases 809 were X-rayed prior to operation and 60 of these showed evidence of past tuberculous pulmonary infection, i.e., 7.4 per cent. Thirty-two of the 955 patients developed active pulmonary tuberculosis after partial gastrectomy, i.e., just over 3 per cent., though not all these had positive pre-operative X-rays; and, as a corollary, not all the 60 with positive pre-operative radiographs developed tuberculosis. The significant factors are under-weight and a high gastric ulcer demanding a major gastrectomy.

### **Pseudo-Membranous Entero-Colitis**

This dramatic and dangerous complication is fortunately rare, and in a recent paper coming from my own department in collaboration with another surgical unit, Dawson-Edwards and Morrissey (1955) found only 35 cases of severe diarrhoea out of the 1,700 partial gastrectomies carried out by the two firms, and they give details of their personal experience of eight of them. The pseudo-membranous element is probably a non-specific response of small and large bowel to "many forms of trauma

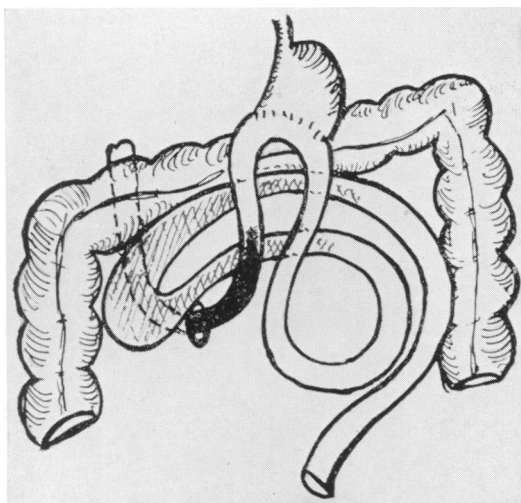
such as bacillary dysentery, paratyphoid, infection, uraemia, etc.” When no pseudo-membranous reaction develops the mucous membrane is found at autopsy to be in a state of acute necrosis. After a satisfactory two or three post-operative days, diarrhoea starts and on occasions may reach cholera-like proportions, and the stools may contain blood and mucus. There is a rapid development of severe dehydration, with rising pulse and falling blood pressure, and peripheral vascular failure may set in suddenly. At the same time, the urinary output diminishes. Sometimes, these signs of collapse may develop when the diarrhoea of itself seems insufficient to account for it, but at post-mortem large quantities of fluid are found in the lumen of the bowel and its walls are oedematous, thus accounting for far greater loss of fluid from the circulation than was suspected. It is in these latter cases that oliguria should be a warning that entero-colitis is in full progress. The cause is in doubt. Two cases only of the above showed pathogenic organisms, namely, staph : aureus in one and pyocyanus in one. Some authorities think that the use of antibiotics is responsible, permitting the rapid proliferation of organisms harmful to the intestinal mucosa and normally kept under control by the natural flora and fauna of the gut but now suppressed by the antibiotics. There is no doubt that a lethal form of enteritis may follow antibiotic treatment, but other authorities consider it to be different from pseudo-membranous entero-colitis, and so do we. The only effective treatment is at once to replace the fluid loss to the circulation and this may mean giving 6 to 10 litres parenterally in the twenty-four hours, at the same time keeping careful watch on the electrolyte levels, particularly potassium, and restoring these to physiological balance. The loss of blood and dead epithelium will also lead to hypoproteinaemia. Dawson-Edwards and Morrissey saved three cases by prompt recognition of the potential dangers of the condition and by the immediate employment of these heroic fluid replacement measures. Bockus (1944) in America, and Bruce (1953) in this country, as well as a number of others, have written on this subject.

#### **Acute or Sub-Acute Post-Operative Obstruction**

It has long been recognised that any man-made gap produced by an operation should be obliterated lest a coil of intestine slip through it and become embarrassed, obstructed, or even strangulated. Of such are the left para-colic gutter following colostomy, the right para-colic gutter following ileostomy, the transverse meso-colon following retro-colic partial gastrectomy, or any gap in the mesentery following operation on the small intestine ; and there are many more. It is only during the past few years that cases of intestinal obstruction have been reported following the ante-colic type of the Polya operation, the result of a coil of intestine having passed through the gap between the anastomosis in front and the transverse colon behind. I encountered my first case of this in 1950, and as a result of reporting it later received from all over the world notes of many more, and last year I published the analysis of the fifteen cases so

## THE COMPLICATIONS OF PARTIAL GASTRECTOMY

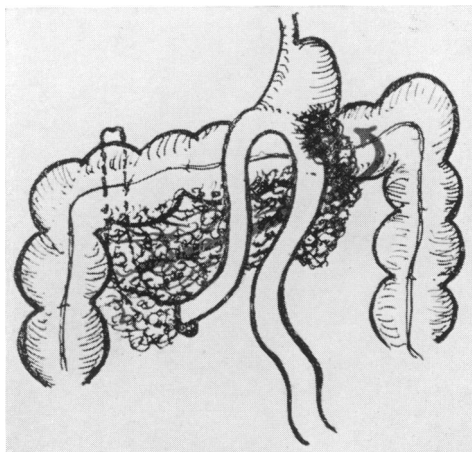
collected (Stammers, 1954). There are at least six different varieties, and unless one is aware of them, the state of affairs as revealed at operation



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Fig. 1. Showing efferent loop passing from left to right through gap.

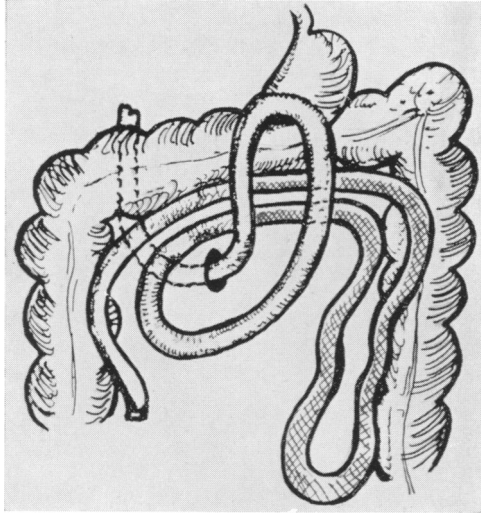
can be most puzzling (Figs. 1-6). Four of the six varieties were associated with the usual afferent-loop-to-lesser-curve technique :



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Fig. 2. This shows the omentum having passed from right to left behind the anastomosis and becoming adherent to the front of the stomach and efferent loop.

(a) efferent loop passing through the gap from left to right ; (b) omentum passing from right to left ; (c) efferent loop passing from right to left ; (d) afferent loop passing from right to left, this latter occurring only when



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Fig. 3. Efferent loop passing from right to left through the gap and back into the greater sac again.

a loop of something more than 15 cms. has been employed. A fifth variety (e) occurred after an efferent-loop-to-lesser-curve anastomosis had

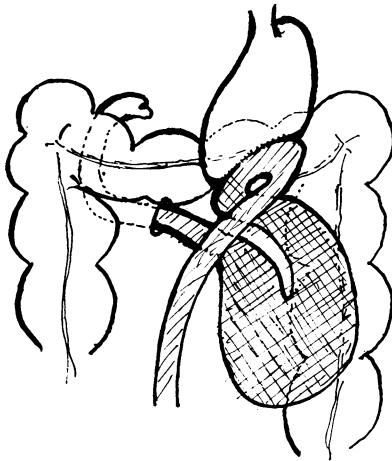
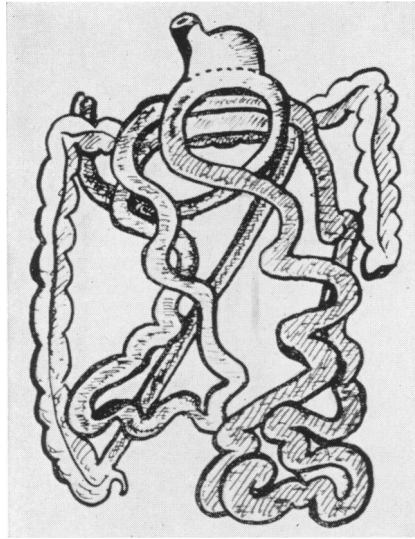


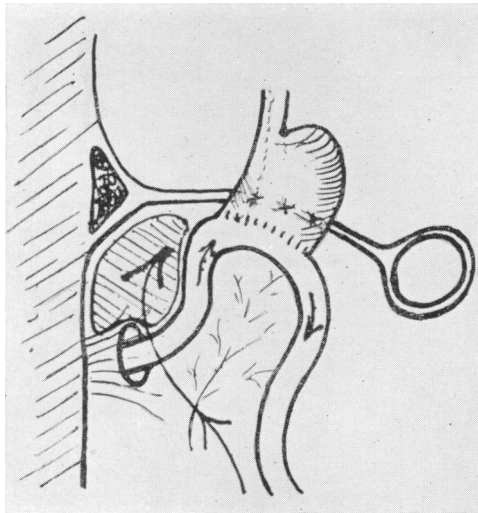
Fig. 4. Long afferent loop passing from right to left through the gap.

THE COMPLICATIONS OF PARTIAL GASTRECTOMY



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Fig. 5. In this case, a loop of ileum passed from left to right through the gap (efferent loop to lesser curve).



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Fig. 6. The case of retrocolic gastrectomy in which efferent loop passed from right to left through the gap.

been used, and in this the ileum (not jejunum) passed from left to right through the gap leaving the last 20 cms. stretched like a tight strap. The sixth variety (*f*) is very rare though certainly one has been published since my paper, and it is associated with the retro-colic type of Polya operation (Morton, Aldrich and Hill, 1955). In both these cases the edge of the opening in the transverse meso-colon had been stitched to the stomach in the orthodox manner. Nevertheless, this technique still may leave a small opening formed by the afferent loop just proximal to the anastomosis, the uppermost part of the mesentery, and the posterior abdominal wall. It was through this opening that a coil of efferent loop had slipped. Tanner (1954) mentions these obstructions in his Lettsomian Lectures of 1954.

As might be expected, such herniations cause some degree of obstruction, but it may be little more than mechanical embarrassment of the bowel. On the other hand, strangulation and gangrene of the loop may occur and this is especially likely to happen when the afferent loop is the one involved. It is not surprising, therefore, that symptoms are often of the vaguest, and always puzzling. The commonest time of onset is between the third to sixth post-operative day, by which time the Ryle's tube has usually been withdrawn and the patient is having by mouth 3 to 6  $\frac{3}{4}$  (90 to 180 ml.) of fluid hourly. He usually complains of unpleasant fullness and feels vaguely less well or really ill. He usually vomits, though one of the disconcerting things is that in the afferent loop herniation there may be none whatsoever. The fullness may change to colicky pain but, on the other hand, it may never amount to this, presumably because there is little more embarrassment than the loop hanging over the anastomosis. On examination there may be slight epigastric tenderness and even an indefinite mass or an area dull to percussion to the left of the midline in the epigastrium. Little wonder then that many have been missed, and are still being missed. The symptoms are usually thought, at first, to be due to oedema of the stoma, and on re-establishing the gastric suction and parenteral fluids the patient immediately improves for a while, even for two or three days. However, the continued vague mass and tenderness in the left epigastrium, together with a recurrence of the symptoms on removing the Ryle's tube, should make one think of the possibility of one of these herniations. This retro-anastomotic gap is another of these man-made gaps that must be closed as a routine. Special warning is given against employing a long afferent loop: it carries three disadvantages, one of which is its possible herniation from right to left through the gap referred to: and it is far the most dangerous of the six types described.

It is interesting to speculate what happens if the herniation reduces itself, indeed, becomes recurrent. Two of the cases I reported developed six months and two years respectively after the original operation; and Morton, Aldrich and Hill (1955) recently published five cases, one of which

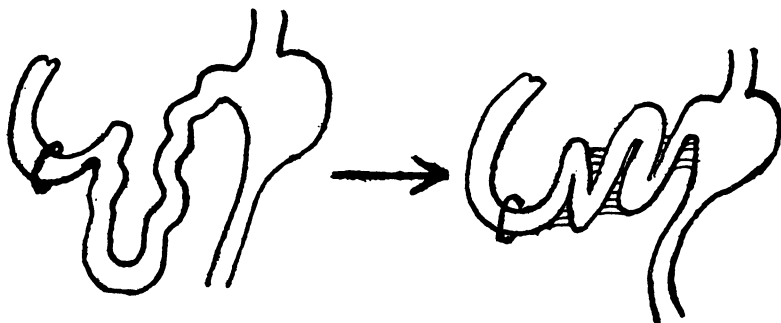


## THE COMPLICATIONS OF PARTIAL GASTRECTOMY

developed ten years after the operation. One does sometimes meet cases who, following their gastrectomy, complain yearly of two or three attacks of pain and nausea lasting from a few hours to a day or so, which fit in much more with sub-acute obstruction than with any of the more usual post-gastrectomy syndromes. The possibility of recurrent herniation as the cause is certainly worthy of consideration, though admittedly difficult of proof. I repeat, this gap must be closed.

### Post-Gastrectomy Syndromes

These almost all follow the Polya type of operation, and it is the present custom to divide these complications into "afferent" and "efferent" loop syndromes and this simple classification of causes has certain merits, though those usually described do not exhaust all possible mechanisms. Professor Wells (1955) in his recent lecture, dealt with the more generally recognised afferent and efferent loop conceptions, but in our series of 1,000-odd gastrectomy cases we have encountered other mechanical factors, which I described in 1953, but which I have not seen published elsewhere, yet which are of interest to those who are trying to understand and remedy these various syndromes—and, more important still, to prevent them.

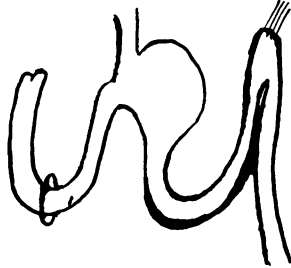


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Fig. 7. Long afferent loop having become concertinaed.

(a) I have encountered five cases referred from other hospitals where the use of a long afferent loop (6 to 18 inches—15 to 45 cms.) has led to the development of a typical afferent loop syndrome though resulting from a variant of the mechanism described by Wells and Welbourne (1951). As the line drawing shows (Fig. 7), the long loop has, over the course of years, become concertinaed, thus leading to a hold-up of bile and pancreatic juices. By separating the adhesions the loop can be unravelled, but it is too long for the Steinberg (1949) operation; it must either be shortened by excision or unpicked and re-anastomosed with a short loop (4 to 6 inches—10 to 15 cms.) This is a second disadvantage of the long afferent loop, and its avoidance would prevent the risk of such a concertina formation.

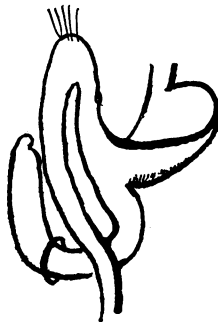
(b) On three occasions now I have encountered cases who, after several years of comfort following Polya partial gastrectomy, have developed early fullness after meals and vomiting. In two, the cause was that a piece of efferent loop some 12 inches (30 cms.) from the anastomosis had become hooked up at an acute angle to the region of the hilum of the spleen. The sketch (Fig. 8) shows how a meal distends the proximal part, thus causing temporary obstruction. In the third case (Fig. 9) a somewhat similar thing happened excepting that the efferent loop had swung over to



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Fig. 8. Adhesions leading to hairpin bend of first part of efferent loop.

the right, rotating the stomach with it, and had become fixed to the under-surface of the liver, causing the same post-prandial temporary obstruction as in the other two. As a general rule "adhesions" as a diagnosis is a bad one, but where adhesions tether a piece of gut at a single point well out to the periphery, as in the pelvis, or as in the three above-mentioned cases, thus producing a hairpin bend, they may well be the cause of



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Fig. 9. Another form of embarrassment of efferent loop by adhesions.

genuine symptoms, and radiographical studies with rabar will sometimes reveal the kink, as it did in two of our cases.

(c) Regarding "dumping," I have nothing new to add, but will mention a few points with reference to later post-gastrectomy discomforts that we have experienced and studied in my own department and which are not

so generally recognized. One of the most disappointing features of gastrectomy cases is the relatively large number who fail to gain weight even though otherwise comfortable and, therefore, not falling into the group with complications. Wells and MacPhee (1954) have shown that this tends to be commensurate with the smallness of the gastric remnant. A much smaller group have other complaints too, such as, lack of energy, and a feeling of intestinal hurry, or "the food reaches here"—pointing to the region of the pubis—within a few minutes of ingestion. Quite often this is true since radiographic studies of a barium meal show the first part to have reached the caecum within 5 to 10 minutes. These are the people who often continue to lose weight, and who pass several loose stools each day, which they may describe as diarrhoea and which, as shown by Brain in 1949, when working in my department, is due to steatorrhoea (Brain and Stammers 1951). It is easy to theorize that the food, passing direct from stomach to efferent loop never becomes properly mixed with bile and pancreatic juices, or to put it in another way, that these enzymes never catch up with the food—"chasing", as it has been called—and, in consequence, poor fat absorption results. Based on this assumption, Dr. French has suggested giving pancreatin 2 gms. in milk with meals, and this régime has improved several of our cases. Other factors, such as, intestinal hurry, altered flora and fauna, altered pH, or a combination of these, have to be considered. Patients with evidence of intestinal hurry are often benefited by belladonna or probanthine. The peculiar thing is that so many patients are completely free from these discomforts, and one feels that there must be some individual peculiarity in their metabolic processes, just as Sir Arthur Hurst (1937) used to say of the anatomy of the colon "colons are like noses, some being long, some short." The fact remains that 80 to 90 per cent. of cases are quite undisturbed, from the metabolic point of view, by a procedure which makes it possible for the stomach to empty rapidly into the jejunum. The two factors that encourage this rapid emptying are, firstly, the small stomach reservoir and, secondly the absence of a sphincter. This latter is an essential piece of physiological mechanism, opening and closing according to the pH of the stomach contents and ensuring adequate mixing of food with bile and pancreatic ferments. We have not yet learnt how to make an active sphincter: the various attempts to mimic one by varying the site and size of the stoma are not good enough. Even the Billroth I operation does not give a sphincter.

(d) Brain and, later on, Duncan, working in my department, have studied the "little stomach" syndrome and have shown that it rarely develops unless the stomach remnant is of less than 250 ml. capacity.

### **Objections to the Long Afferent Loop**

Two of these have already been mentioned, firstly, the tendency to concertina formation, thus giving a typical afferent loop syndrome and, secondly, in the ante-colic Polya operation when the retro-anastomotic

gap has not been closed, the risk of the loop herniating through the gap. There is a third objection, namely, that it may hang down, and become distended, thus forming a reservoir for bile and pancreatic juices which are thereby prevented from reaching the stomach or efferent loop for admixture with food, and steatorrhoea results. This, at first, sounds like the steatorrhoea already referred to in the previous paragraph, but when due to the long afferent loop it is readily corrected by a second operation. I strongly suspect that there may be minor degrees of this disturbance when the long loop is employed. A recent case of Dr. C. Hawkins and Dr. J. French is a good example of steatorrhoea following retention in a

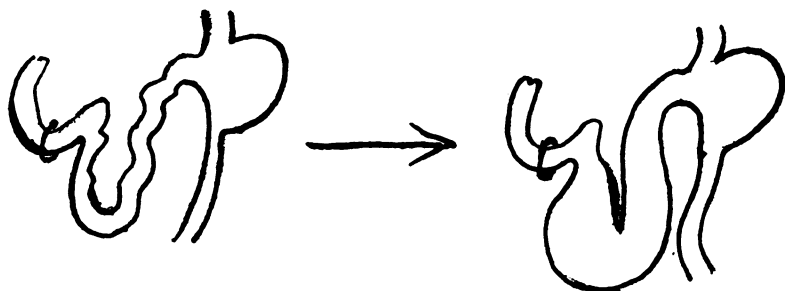


Fig. 10. A long afferent loop acting as a sump for bile and pancreatic juices, thus delaying their proper mixture with food and consequent steatorrhoea.

long afferent loop, and I am grateful for their permission to quote it. Probably from the beginning the long loop hung down, producing a hairpin bend at the lesser curve, and this, together with adhesions, lead to some stenosis. Thus, there was a hold-up of bile and pancreatic juices. The line drawing (Fig. 10) shows this.

### Comments

In referring to the later complications of gastrectomy I have only mentioned a few less well recognised causes that have come our way on the unit, yet which must occur in other centres. In conclusion, there is little wonder that so much thought is being given to these important problems. Why, one might ask, is the Billroth operation not used more often, since it seems to be more free from some of the later complications? Unfortunately, in the majority of duodenal ulcers the duodenum is too scarred; incidentally, of course, like the Polya operation, it leaves no sphincter. The other trouble is that stomal ulcer on the gastric side seems unfortunately common.

Vagotomy alone is unjustifiable since the failure rate is so high. Patey (1953) recently recorded the results from Middlesex, and our own results in ninety-three cases carried out in Birmingham between 1947 and 1950, though not yet published, are exactly comparable. We all await with great interest the five-year reports from those centres employing (1) minimal Billroth I gastrectomy combined with vagotomy; (2) pyloroplasty with

## THE COMPLICATIONS OF PARTIAL GASTRECTOMY

vagotomy, and (3) gastro-enterostomy with vagotomy. One knows from Heuer's monograph (1944) and from Wells and MacPhee (1954) that the five-years period is not enough to give the natural history of peptic ulcer treated by surgical operation.

### CONCLUSION

I urge that when the ante-colic technique is used, the retro-anastomotic gap created thereby be closed ; that the long afferent loop be abandoned ; and that experiments on the manufacture of an active sphincter be pursued.

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## ROYAL COLLEGE OF PHYSICIANS AND SURGEONS OF CANADA

At the Convocation of the Annual Meeting of the Royal College of Physicians and Surgeons of Canada held in Quebec on Saturday, 22nd October, the Honorary Fellowship was conferred on the President of this College, Sir Harry Platt.

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### THOMAS VICARY COMMEMORATION

THE THOMAS VICARY Lecture was delivered on Thursday, 27th October, by Professor K. F. Russell of Melbourne, who chose for his subject : " John Browne 1642-1702." This was followed by a dinner at the College at which the Court of the Barbers' Company were entertained by Council.

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Extract from Plarr's *Lives of the Fellows* :—

" T. was a good sportsman and shot deer and wild boars, an Alpine climber, an excellent linguist, and an archaeologist." (p. 439.)