

1. Where the growth extends too far into the posterior mediastinum to permit of removal.

2. Where a small part only of the circumference of the oesophagus is involved.

3. Where the whole or greater part of the circumference is invaded by tumour but the total length does not extend to more than 2 cm.

4. Where the length is greater than 2 cm. or there is involvement of the trachea or larynx in addition.

In the first case, of course, further operation is impossible, and the oesophagus must be closed by two rows of sutures.

Cases which come into the second group are unfortunately but rarely seen. In recent years there has been only one such case operated on in this hospital; in this patient a longitudinal ulcer, 2 cm. long, was excised from the oesophagus, and the wound was closed along the greater part of its extent, but the patient unfortunately died some days later owing to the spread of infection into the surrounding tissues.

When the growth involves the greater part of the circumference of the oesophagus but has not spread beyond the outer coat, and is not more than 2 cm. in length, then it is possible not only to excise that portion of the tube with a margin of healthy tissue above and below, but also to bring the two cut ends into apposition and to suture them together. Leakage, however, is apt to occur, and therefore the outer wound should not be completely closed, so as to allow for drainage. It is most essential, however, to limit the spread of the discharge from the oesophagus into the wound; this can be done to a great extent by deep stitches, bringing into apposition the surrounding muscles, and covering, as far as possible, the carotid sheath by suturing the adjacent muscles over it. The escape of septic matter from the oesophagus may then be regulated to the track left open for it. Another precaution is the introduction of a Gluck's oesophageal tube into the oesophagus; the dilated upper end rests on the back of the tongue and catches most of the saliva that is swallowed; and also later, when the patient is taken off rectal feeds, the fluids swallowed are conveyed by the tube to a portion of the oesophagus well beyond the anastomosis. Apart from the actual technique in the removal of the affected portion of the oesophagus, the essentials to success are the thorough cleaning of the mouth and removal of carious teeth before the operation, the introduction of a Gluck's tube as soon as the anastomosis is complete, and the approximation of all the adjacent structures between the skin wound and the oesophagus so as to prevent the spread of infection among the tissues of the neck. In all cases, of course, in which an excision of the growth is effected the glands, whether obviously involved or not, must be dissected out.

Finally, we come to the last group of cases—those in which the ends of the oesophagus cannot be approximated after removal of the growth, and in which perhaps, also, a portion of the trachea has to be excised. As to the latter, all that need be said is that the lower end must be sutured into the wound and a tracheotomy tube tied in. Later the patient can learn to speak quite comfortably with a Gluck's phonation apparatus. The upper and lower ends of the divided oesophagus must also be drawn out and sutured to the skin; the patient can for the time be fed through the lower opening, and the secretions escaping from the upper end can be controlled by an oesophageal tube passed down the pharynx, out of the upper oesophageal opening and in again at the lower opening. By this means also the patient can enjoy the pleasure of swallowing his own food. Later a plastic operation can be undertaken to restore the continuity of the oesophagus. This is done by replacing the excised portion by a tube formed from the skin which lies between the two cut ends of the oesophagus. The skin is freed on either side and the edges rolled over and sewn together, so that the outer surface of the skin now forms the inner lining. The ends of the new tube are now united to the cut ends of the oesophagus, and the whole covered over by undercutting the skin on either side and stitching these flaps together over the raw surface.*

* A very full account of plastic operations for restoring the continuity of the oesophagus can be found in Professor von Hacker's paper, Ueber Resektion und Plastik am Halsabschnitt der Speise-röhre, insbesondere beim Carcinom, *Verhandlungen der deutschen Gesellschaft für Chirurgie*, Thirty-seventh Congress, Berlin, 1908.

When the upper end of the divided oesophagus is so close to the pharynx that it cannot be brought out of the wound, then precautions must be taken to provide for the escape of the secretions in the same way as described in the operation of excision and end-to-end anastomosis.

ON THE RADICAL OPERATION FOR CANCER OF THE PYLORUS:

WITH ESPECIAL REFERENCE TO THE ADVANTAGES OF THE TWO-STAGE OPERATION AND TO THE QUESTION OF THE REMOVAL OF THE ASSOCIATED LYMPHATICS.*

BY

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THE subject of the radical treatment of cancer of the stomach by surgical operation is one on which a great deal of work has recently been done. And yet, owing chiefly to the long delay which occurs before the cases are submitted to the surgeon, the immediate mortality is very high and the proportion of lasting cures is disappointingly low. It is my object to discuss the causes and remedies for this state of affairs and to support the following propositions:

1. There is a good prospect of cure in early cases of the disease.

2. That exploratory operations should be performed for diagnostic purposes in all doubtful cases.

3. That the immediate operative mortality may be greatly reduced by operating in two stages.

4. That a more systematic attempt should be made to remove the whole of the lymphatic area connected with the stomach.

5. That the limits of operability, both for palliative and radical operations, should be more rigidly defined, so as to lessen if possible the number of surgical failures.

The following table shows the chief features of the cases upon which I have myself operated:

Order.	Sex.	Age.	Length of History.	Pain.	Vomif.	Emaciation.	Tumour	Free HCl.	Operation.	Interval.	Result.	Remarks.
1	M.	57	8 mths.	+	+	+	-	-	Billroth I	-	D.	Died on third day, probably from leakage.
2	F.	56	12 mths.	+	+	+	+	-	Two stage	7 days	R.	Lived for seven months and then died of uraemia.
3	M.	66	9 mths.	+	+	+	?	-	Two stage	7 days	R.	Died of recurrence nineteen months later.
4	M.	55	5 years	+	+	+	?	-	Two stage	12 days	R.	Alive and well now after two and a half years; a very early cancer growing in a chronic ulcer.
5	M.	32	2 mths.	+	+	?	?	+	Two stage	10 days	R.	Alive and well now one and a half years after operation.
6	F.	38	4½ mths.	+	+	+	+	+	Billroth II	-	D.	Died seventeen days after of asthenia.
7	M.	54	12½ mths.	+	+	+	+	-	Two stage	12 days	D.	Died of shock two hours after the operation.
8	M.	49	3 mths.	+	+	+	-	-	Two stage	30 days	R.	Alive and well (three months).

It will be noted that of these cases 6 were men and 2 women, and that the ages varied between 32 and 66. In 6 cases I operated in two stages with only one death, whereas in the two cases in which excision and anastomosis were done at the same time both died. Other points which require further notice can be more conveniently discussed under the various headings into which the subject naturally divides itself.

* Part of a paper read before the Surgical Section of the Royal Society of Medicine on February 8th.

ETIOLOGY.

The only determining factor of importance of which we know anything is the pre-existence of an ulcer. In one of my cases (No. 4) this factor was present, and I was fortunate enough to time my operation at the very earliest stage of malignant transformation. Judged from a clinical point of view about 12 per cent. of all cases of cancer of the stomach are caused by an ulcer (Stumpf,⁸ 6 out of 47 cases). But according to Wilson and MacCarty⁴⁹ there is strong pathological evidence for associating the pre-existence of an ulcer with cancer of the stomach in nearly 80 per cent. (125 out of 158 cases of growths of the pylorus resected by the brothers Mayo).

SYMPTOMS, SIGNS, AND DIAGNOSIS.

In cases which are presented for surgical treatment the symptoms have usually been present for many months. In my cases, apart from the one preceded by an ulcer, the duration was 2, 3, 4½, 8, 9, 12, and 12 months, with an average of about 7. It is quite clear that in most cases a most unreasonable delay occurs before the surgeon is consulted, and that this delay must often involve the growth becoming unfavourable for radical treatment.

It will be seen from the table that in my cases the cardinal symptoms of loss of flesh, vomiting, and pain were never absent. Of these, emaciation is probably the most important, the loss occurring so rapidly, and being so unamenable to treatment. In any doubtful case, a steady gaining of weight is in my opinion the only condition that renders a postponement of an exploratory operation justifiable. Makkas,¹ in speaking of over 600 cases of cancer of the stomach, states that this sign of emaciation never failed.

The Occurrence of a Tumour.

In only 3 out of my 8 cases was a definite tumour constantly present. In one case a tumour was sometimes present and sometimes absent; in 2 cases there was a sense of resistance, and in 2 there was nothing abnormal palpable. The proportion of operable cases in which a tumour is present is, according to various authors, 51 per cent. (Stumpf⁸), 79 per cent. (Makkas,¹ 132 out of 167), or 70 per cent. (Mizokuchi,⁸ 43 out of 61). It must therefore be most emphatically stated that no case can be diagnosed as non-malignant because of the absence of tumour, and, on the other hand, that no case should be regarded as inoperable simply because a tumour is present. There may be four quite different constituent elements in a stomach tumour, namely (1) A contracted rectus muscle; (2) a tonic contraction of the pylorus and antrum pylori, or of the whole stomach; (3) a mass of new growth or inflammatory tissue in the stomach; (4) an invasion of the parts round the stomach by new growth, especially the parietes and peritoneum. The fact that a stomach tumour may be formed by tonic contraction in the neighbourhood of an ulcer or new growth has not, I think, been sufficiently appreciated. A tumour which is movable and variable in consistency is favourable for operation, whilst a fixed nodular mass is the reverse.

Chemical Changes in the Stomach Contents.

All observers are practically agreed now that the absence of free HCl and the presence of fatty acids in the stomach contents should only be regarded as of importance as confirmatory evidence. Of the 7 among my cases in which these tests were applied free HCl was absent in 5 and lactic acid present in 3.

Diagnosis.

The important point in the diagnosis of cancer of the

stomach is the early recognition of the possibility of malignancy. Of course, if one waits long enough almost every case will reveal its own nature sooner or later. It should be enough for us to know that, in any given case of dyspepsia, emaciation is taking place steadily to make us suspect organic disease of the stomach, and advise an exploratory operation, unless the symptoms definitely improve under medical treatment. When this exploration is made, however, the difficulties are often not at an end. In my fourth case I actually removed a piece of pyloric growth after doing a gastro-enterostomy, and the microscope proved this to be inflammatory. But I was not satisfied, and having explained the situation to the patient, I excised the pylorus a fortnight later, and at the back of it was found the early stages of cancer. Wilson and MacCarty's⁴⁹ paper, already referred to, gives many illustrations of specimens which showed only inflammatory tissue in one part and malignant in another. Cases are often subjected to resection under the impression that they are malignant, and the microscope shows nothing but inflammatory tissue—for example, Frazier,⁶ Taylor.⁷ On the other hand, it often happens that a hard mass is regarded as malignant and inoperable and a gastro-enterostomy done for mere palliation, and the patient, instead of dying, gets quite well and lives for years, to prove that the mass must have been inflammatory—for example, Lilienthal,⁸ Wolfier,⁹ Patterson,¹⁰ Kindle.¹¹

The mere disappearance or diminution of a tumour of the pylorus after gastro-enterostomy cannot be held

to be proof of its benignity, because, as in my fourth case, the mass may be composed of much inflammatory and little malignant tissue. The former disappears and leaves the latter as a cancerous germ to fructify later. Dowd¹² relates such a case—a young man in whom at a second operation after a gastro-enterostomy the pyloric

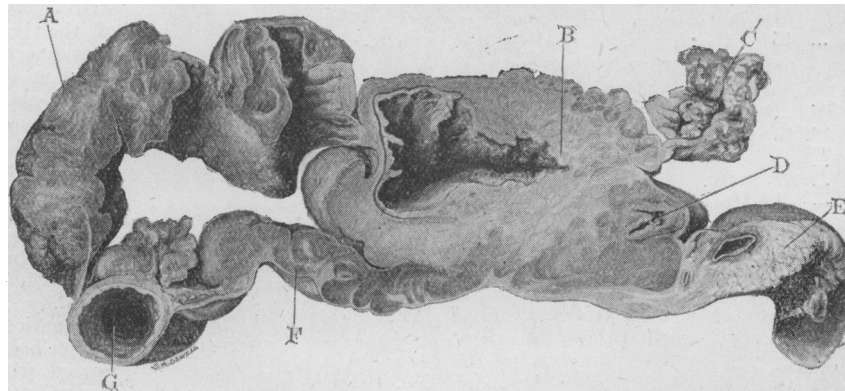


Fig. 1.—A, Great omentum. B, Primary growth in lesser curvature of stomach. C, Gastro-hepatic omentum. D, Duodenum. E, Pancreas. F, Transverse mesocolon. G, Transverse colon.

tumour had apparently disappeared, and nothing further was done; but eighteen months later the patient died of peritonitis due to perforation of a malignant growth of the stomach.

The practical deduction from this great difficulty in the distinction between inflammatory and malignant disease of the stomach seems to me to be this: Every case should be submitted to no more than gastro-enterostomy in the first place. The abdomen is opened again in from two to four weeks, and if there is still any nodular mass it should be excised. If, on the other hand, the mass has entirely disappeared, it is probably benign, but the case should be kept under observation for the next twelve months.

OPERATIVE TREATMENT.

Before discussing the value and scope of the two-stage method, it may be well to give an idea of the results of the three classical operations. This is given in a large series of figures collected by Goldschwend¹⁶ as follows:

Method.	No. of Authors.	No. of Cases.	Deaths.	Percentage.
Billroth I ...	11	279	102	36
Billroth II ...	9	189	77	40
Kocher ...	3	54	14	26
All methods ...	19	553	229	51

It is probably not fair to argue from these figures that Kocher's operation, in which an end-to-side junction of

duodenum to stomach is effected, is much safer than the others, for it has been employed for cases of early growth, and is not applicable to advanced disease. The main point proved by these figures is that even in the hands of experienced operators the mortality of the operations for resection of cancer of the stomach is about 50 per cent.

The reason for this high death-rate is easy to understand. The patients are often of advanced age; they are reduced to a condition of marasmus by pyloric stenosis. The stomach itself is in a most unhealthy condition, because it is the seat of a cancerous mass, and also because its contents are stagnant and decomposing. Is it any wonder, then, that an extensive resection followed by an anastomosis should result either in fatal shock, or that the patients should have too little recuperative power to resist peritonitis or other post-operative sequel?

I have been able to collect 127 cases in which the cause of death after resection operations is given. They are from the following authors, namely: Goldschwend,¹⁶ Rasumowski,²⁸ Müller,²⁴ Branham,²⁵ Frazier,⁶ Bishop,²⁶ Brunner,²⁷ Garré,²⁸ Kronlein,²⁹ Steinthal,³⁰ Czerny,³¹ Korte,³² Graham,³³ Makkas,¹ and Mizokuchi.³ Placing these together, the causes of death are as follows:

Cases.	
79	Peritonitis (including "leakage" or "leaking from the duodenal stump") ...
23	Shock
	Heart failure
	Collapse
	Weakness
	Marasmus
	Narcosis
20	Lung complications, especially pneumonia ...
2	Haemorrhage ...
1	Septic cholangitis ...
1	Brain symptoms ...
1	Colitis ...

For practical purposes, then, the causes of death are three: peritonitis, shock, and lung complications. It is certain that the danger of all these can be greatly lessened by dividing the operation into two stages. At the first stage gastro-enterostomy is performed. The patient rapidly gains in strength and vigour, and the stomach is relieved from its stagnation, whilst in many cases the inflammatory element of the tumour mass greatly diminishes. Then when, after an interval of one or two weeks, the resection is undertaken, the operation is much shorter, and the patient's vitality being greater, there is much less danger of his succumbing either to peritonitis, shock, or to lung infection.

In my series of 8 cases, the whole operation was performed at one stage in 2, and both these patients died. In 6 cases the two-stage operation was performed, and of these only one died. I have been able to collect 12 other cases in which the two-stage operation was employed from the following authors: Franke³⁴ (1 case), Tuholski³⁵ (2 cases), Kammerer³⁶ (1 case), Tixier³⁷ (2 cases), Jaboulay³⁸ (1 case), Stumpf² (1 case), Robson²¹ (1 case), and 3 other cases quoted by Mayo Robson.²¹ Adding these to my own series, we have 18 cases, of which only 3 died—a mortality of only 16.6 per cent.

In addition to these definitely described cases, there are many authors who speak well of the method. Such are Quenu,³⁹ Doyen,⁴⁰ Czerny,³¹ Hahn,⁴¹ Kummel,⁴² and Krause.¹³ It will be noted that the interval between the two stages of the operation varies very much with different operators. In my own cases the intervals were seven, seven, ten, twelve, twelve, and twenty-eight days, and I am inclined to think that a fortnight represents the average time which ought to elapse between the two

operations. In cases recorded by other surgeons, however, the interval has usually been much longer—generally about two months (fourteen days, six weeks, two months, ten weeks, three months). It seems to me that such a long interval is quite unnecessary, as patients gain in strength very rapidly after the gastro-enterostomy, and this long postponement gives time for the cancer to spread or to become disseminated, while the adhesions left after the first operation become often densely organized. Kammerer,³⁶ Krause,¹³ and Tixier,³⁷ in particular, call attention to the difficulty caused by these adhesions. If the interval is only a fortnight these adhesions are easily broken down and do not add materially to the difficulty of the operation.

The Removal of the Lymph Area.

A pretty general agreement concerning the amount of the stomach and duodenum which should be removed has been arrived at. It should include the whole of the lesser curvature, or at least that part of it up to the point where the coronary artery and lymphatics join it, about a half or a third of the greater curvature, and about 1 in. of the duodenum.

But in connexion with the removal of the lymphatic area associated with the stomach there has hitherto been no definite plan at all comparable, for example, with that adopted in cancer of the breast. So far all that has been done and advised is the removal of the lymph glands connected with the stomach along its lesser and greater curves, together with certain glands on the anterior face of the pancreas. But it is obvious that this by no means includes all the lymph channels which lie in the path of what Sampson Handley calls lymphatic permeation. The largest lymph-bearing area connected with the stomach is in the great omentum, and from this the lymph vessels loop back in front of the transverse colon, above the transverse mesocolon to the peritoneum in front of the pancreas, ending in the lymph glands round the coeliac axis. Before discussing the possibility of the removal of this wide area of peritoneum it may be well to give some evidence that

cancer cells do really travel thus along the tissues named. Dobson and Jamieson³⁰ have recently made preparations showing the lymphatics connected with the stomach. I have shown the chief gland groups which they describe in Fig. 2. They state that the glands associated with the hepatic artery lie along its gastro-duodenal branch, whilst a chain of four to seven glands are associated with the right gastro-epiploic artery, lying below the vessel and having a tendency to stray down between the layers of the great omentum, especially in the case of adults. These never extend to the left of the middle of the great curve, and their efferent vessels all end in the subpyloric glands. It is also noted that some of the lymph vessels from the pylorus are not connected with the lower coronary glands, but go direct to the glands which lie below the origin of the coronary artery. Lymph vessels from the great curvature run into the great omentum, and finally looping back, end in the gastro-epiploic groups. Lengermann⁵¹ found in cases of gastric cancer the following involvement of glands: coronary in 50 per cent.; glands on the great curve 37 per cent.; and subpyloric groups in 60 per cent.

Fig. 1 is the drawing of a slice taken from the tissues of an old woman who was admitted to the General Hospital

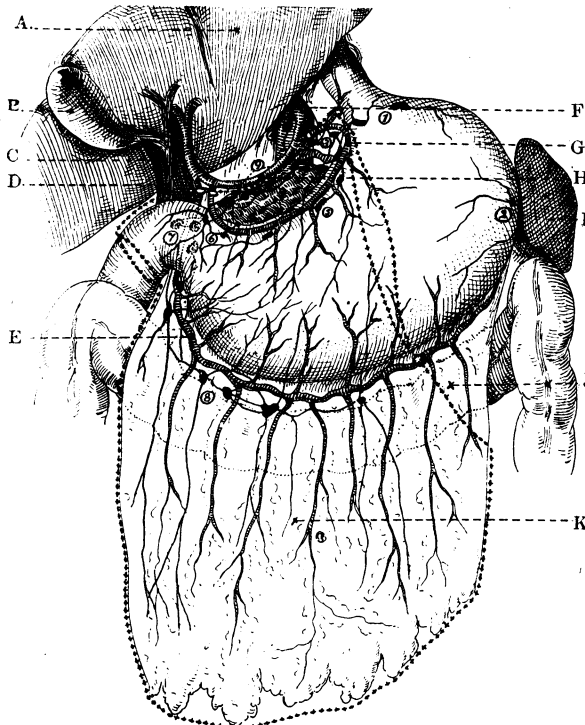


Fig. 2.—A, Liver. B, Gall bladder. C, Portal vein. D, Bile duct. E, Right gastro-epiploic artery. F, Coeliac axis. G, Coronary artery. H, Hepatic artery. I, Spleen. J, Colon. K, Great omentum. Lymph glands: 1, Paracardial; 2, splenic; 3, upper coronary; 4, coeliac; 5, lower coronary; 6, suprapyloric; 7, subpyloric; 8, gastro-epiploic; 9, suprapancreatic.

with enormous ascites, and who died very soon after this had been tapped. She had advanced colloid carcinoma of the stomach, which had extended widely in the peritoneal tissues. This diffuse growth had spread itself in no disorderly fashion, but in the definite planes provided by the lymphatic areas of the omenta. A continuous mass of growth could be traced from the stomach, up the gastro-hepatic omentum, and down the great omentum, when it turned back in front of the colon, which was not involved, along the upper surface of the transverse mesocolon to the tissues in front of the pancreas. Further, the free margin of the great omentum was adherent in the pelvis, and from this point an exuberant mass of growth extended over the whole of the pelvic floor. It is clear, then, that in this case the whole of the great omentum had become permeated with the cancer, and had served as a carrier of cancer cells to the pelvis.

It may be objected that this was a case of such advanced disease that no inference can be drawn from it relating to the early stages of cancer dissemination. But I have been able to demonstrate the same process in a much earlier stage of the disease.

In my seventh case, on beginning the removal of the tumour one week after a posterior gastro-enterostomy, I was surprised to find that the edge of the great omentum was adherent somewhere in the right iliac fossa. This adhesion had not been noticed at the time of the first operation. A very little manipulation served to separate the adherent parts, and it was noted that the point to which the omentum was fixed was at the root of the mesentery adjacent to the ileo-caecal region. The actual point of the omental edge thus separated was apparently thickened and inflamed. After the patient's death the point on the mesentery from which the omentum was separated could be identified as an injected area. Both these tissues (the tip of the omentum and the mesentery) showed unmistakable cancerous infiltration. And this malignant growth at the extremity of the mesentery involving the tissues at the pelvic brim existed with an omentum which otherwise appeared perfectly free from disease. I would venture, therefore, to assert that these cases, confirming as they do what we should expect of the lymphatic areas connected with stomach cancer, prove that the whole of the great omentum ought to be removed in every radical operation.

In confirmation of the suggestion that cancer spreads in this area from the stomach through the great omentum to the pelvic organs, it may be noted that among the scanty records we possess of the condition of patients dying from recurrence of the growth after operation, there are several instances of the recurrence taking place in the pelvis. Goldschwend¹⁶ mentions the case of a woman who died forty-one months after resection of the stomach of malignant disease of the ovary. Makkas¹ relates two cases, one a woman of 39 the other a woman of 40, who died of recurrence in the ovary or pelvis. Goullioud⁴⁶ had

a female patient who died seventeen months after partial gastrectomy of cancer of the ovary.

If it is admitted that the great omentum ought to be removed, this is easily carried out by cutting through the peritoneum, which passes from the back of the omentum to the front of the transverse colon. And in many cases it is then possible to strip the peritoneum off the upper surface of the transverse mesocolon to the front of the pancreas.

The complete removal of the small omentum is fortunately not so important, because it has far fewer lymph vessels than the great omentum. It cannot of course be entirely removed, because it is wrapped round the portal vein, bile duct, and hepatic artery. The lymph vessels from the upper margin of the stomach run in company with the gastro-duodenal and hepatic arteries on the one side, and with the coronary artery on the other, behind the peritoneum which covers the pancreas at the back of the lesser sac of peritoneum. This is the same layer of peritoneum which is continuous with the posterior layer of the great omentum, and it may be removed with it. The coronary artery should be tied as it comes off from the coeliac axis, the gastro-duodenal as it comes off from the hepatic.

The operation which embodies these suggestions I have carried out in all my two cases. It is illustrated by Figs. 2, 3, and 4. In Fig. 2 the stomach and great omentum, with chief vessels and lymphatics, is shown, and the lines of incision indicated by a dotted line. Fig. 3 shows the condition after the removal of parts of the stomach and duodenum, great omentum, and the peritoneum from the front of the head of the pancreas. Fig. 4 shows, by means of a diagrammatic sagittal section, the line along which the peritoneum attached to the stomach is removed.

As regards the ultimate results of operations for the radical cure of cancer of the stomach, the figures of Goldschwend,¹⁶ Clairmont,⁴⁶ Makkas,¹ Kindie,¹¹ v. Eiselsberg,⁴⁶ Mikulicz,⁴⁶ Caspersohn,⁴⁶ give ample information. If added together the result is as follows:

Out of 736 cases submitted to resection, 56 only were known to be alive and well at the end of three years (7.6 per cent.).

Out of 237 cases recovering from resection, 37 were alive and well at the end of three years (15.6 per cent.).

Such results evidently prove that there is great room for improvement in the thoroughness with which the radical operations are performed, and it may be that such improvement lies in the direction which I have above indicated.

CONCLUSION.

In conclusion, the opinions discussed above may be summarized as follows:

1. That a quite unreasonable time is usually allowed to elapse before the patient is presented for surgical treatment.
2. That in the majority of cases the diagnosis is to be made from the cardinal symptoms of loss of weight, vomiting, and pain.

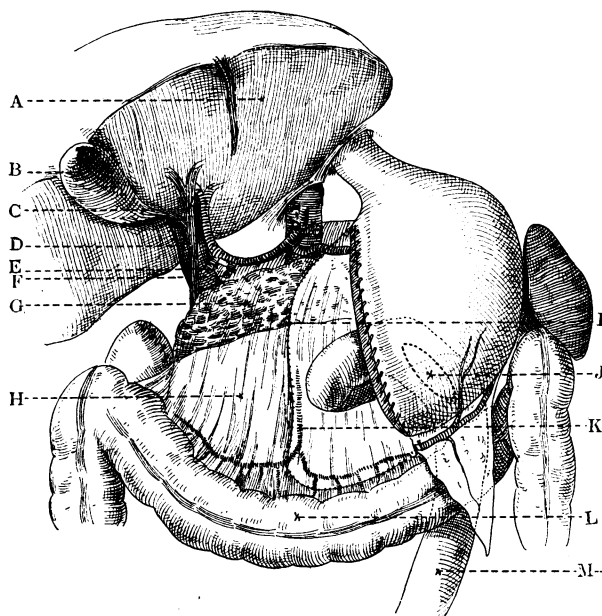


Fig. 3.—A, Liver. B, Gall bladder. C, Bile duct. D, Portal vein. E, Gastro-duodenal artery. F, Pyloric artery. G, Pancreas. H, Mesocolon. I, Cut edge of peritoneum. J, Gastro-enterostomy. K, Middle colic artery. L, Colon. M, Jejunum.

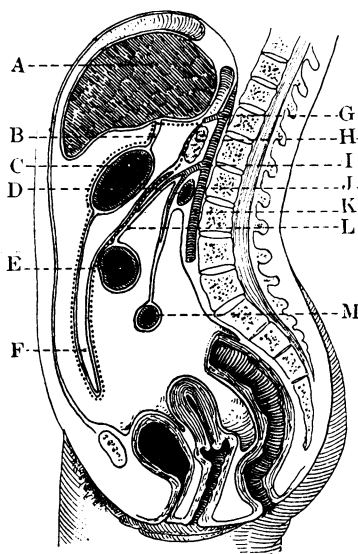


Fig. 4.—A, Liver. B, Lesser omentum. C, Stomach. D, Middle colic artery. E, Transverse colon. F, Great omentum. G, Coeliac axis. H, Pancreas. I, Superior mesenteric artery. J, Duodenum. K, Aorta. L, Transverse mesocolon. M, Small intestine. Dotted line shows area of peritoneum removed with the stomach.

3. That all doubtful cases should be submitted to exploratory operation, unless the body weight rises under medical treatment.

4. That even exploratory operations often leave the diagnosis doubtful. In such circumstances the case should be seen at frequent intervals or else treated by excision.

5. Mortality after resection of cancer of the stomach is about 50 per cent. This is caused by peritonitis, shock, and lung complications.

6. The immediate mortality can be greatly reduced by adopting the two-stage method.

7. That mortality can be further much reduced by excluding cases where the colon, pancreas, or posterior lymph glands are seriously involved.

8. That the adequate removal of the associated lymph areas demands that the great omentum and the tissues in front of the pancreas should be taken away.

9. This can be done by the above-described operation.

10. Remote results of radical operations only give a percentage of 7.6 three-year recoveries of those operated upon. This low figure may in part be due to the inadequate removal of lymphatic tissues.

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FOREIGN BODIES IN THE DUODENUM.

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THE rarity of the impaction of foreign bodies in the duodenum makes it desirable that every case of this accident should be recorded.

History.

A girl, aged 3 years, was admitted into the Belgrave Hospital for Children on August 19th, 1909. Two days before admission the child, who had been very healthy previously, told her mother that she had swallowed a short piece of pencil with a metal extremity, such as is usually attached to a dance programme. The next day she began to suffer from sickness, diarrhoea, and colicky pain. As this continued, she was brought to the hospital, and admitted on the third day after the accident.

When put to bed the child appeared to be in no pain. The

abdomen was not distended, and moved well with respiration. Slight tenderness was present to the right of the umbilicus. The diarrhoea soon ceased. When the child was examined by *x* rays on the day following admission a well-marked shadow, evidently the metal end of the pencil, was seen about 1½ in. from the middle line beneath the right costal margin. With the child lying on her back and the *x*-ray tube beneath her, the dark area appeared to descend fully an inch on deep inspiration. Every day the child was examined with *x* rays, but neither constipating food nor purges made any difference to the position of the shadow.

Operation: Recovery.

On September 1st, twelve days after admission, I decided to operate. An incision, 3½ in. long, was made above the umbilicus in the middle line. On introducing the hand into the abdomen the pencil was at once felt impacted across the gut just at the bend between the descending and transverse parts of the duodenum. It was easily disimpacted and pushed back into the stomach. An attempt was next made to pass a Brüning's foreign body forceps into the stomach, with which, aided by the hand in the laparotomy wound, it was hoped to seize the foreign body, and remove it by the oesophagus. Unfortunately, having no oesophagus tube with me, I was unable to pass the forceps down to the stomach, owing to their points catching in the mucous membrane of the gullet. The attempt was accordingly abandoned. A small incision was made through the anterior wall of the stomach on to the foreign body held between the fingers. The pencil at once shot out, and the small wound was closed by a double row of stitches. Through-and-through sutures closed the abdominal incision.

The wound healed in a satisfactory manner, and the child left the hospital on October 7th.

The pencil was found to be 1½ in. long and ⅜ in. in diameter. The point was not at all sharp.

When the fate of the various foreign bodies that are swallowed is considered, the rarity with which they give rise to any serious trouble during their passage through the alimentary canal must appear striking. Innumerable cases are recorded, both in children and in adults, in which the most varied assortment of miscellaneous articles have been successfully passed by the rectum. Thus Norton¹ describes a case in which a pin 3½ in. long passed through the alimentary canal of a child aged 13 months in twenty-one hours, and Petit de la Villéon² another in which a pin 2 in. long, with a large head and sharp point, was passed by the rectum fifteen hours after it had been swallowed. A third example in which a child of 3 successfully disposed of a pin 3 in. in length is recorded by Silver.³ Goodall⁴ mentions a case in which a pocket-knife nearly 3 in. long traversed the alimentary canal of a child of 2 years in four days. Numerous examples of safety pins having been swallowed by infants without any harm resulting are to be found in the literature, and Holt⁵ mentions a case in which an infant of 6 months managed to dispose of a mouthful of seven such pins, some open and some closed, without any evil consequences. Davis-Colley⁶ describes how a needle 5 in. long only gave rise to trouble when the descending colon was reached, and Mansell Moullin⁷ a case in which 4½ in. of hatpin travelled as far as the ileo-caecal valve in a girl of 19 before it became impacted.

Some interesting observations on the way in which the intestines deal with pointed foreign bodies are referred to by Ross⁸; he mentions the experiments of Müller and Exner, who have shown that in dogs the contact of any sharp pointed body with the mucous membrane of the bowel results in a corrugation of the intestinal wall, which tends to push away the offending body. This action is purely reflex, and occurs just as well after the nerves going to the segment of bowel under observation have been divided. Evidence of a similar action in man is seen in a case described by Kretz,⁹ in which a chicken bone perforated the bowel, and numerous scars were seen in the mucous membrane proximal to the point of perforation.

But foreign bodies do occasionally become impacted even in the duodenum, though relatively few cases seem to have been described. Clement Lucas¹⁰ relates a successful case which closely resembles the one here recorded. A child of 22 months swallowed a French nail 2 in. long, which was seen by the *x* rays in the situation of the second part of the duodenum. When it had remained in the same position for nearly a month Mr. Lucas decided to operate. He opened the abdomen, seized the nail through the duodenal wall, and cutting on to it, removed it. Laurence Jones¹¹ records a case under the care of Mr. Crisp English, in which a girl swallowed 2½ in. of a broken bodkin. For the first few days it appears to have remained in the stomach, but later on it passed through the pylorus, and twelve days after being swallowed the