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CANCER OF THE STOMACH

WITH SPECIAL REFERENCE TO ITS RELATIONSHIP TO GASTRIC ULCER AND THE ADVANTAGE OF A TWO-STAGE OPERATION

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WHEN your president asked me to read a paper before you, I was led to the selection of this subject on account of the excellent work which has been done in the last few years in the operative treatment of this heretofore hopeless disease, which is found most commonly in the stomach. Operations upon the stomach were attended with such terrible mortality that physicians were slow in recommending and surgeons loath to undertake them. But now, owing to the careful work of many able surgeons, the mortality has been reduced so considerably as to justify us in advising operation, except in the late stages of the disease. The results in early cases are excellent, and attended with a very low mortality rate, which fact would cause one to express the hope that in future the means at the disposal of the physician will soon be so improved that he will be able to refer cases of cancer at an early stage to his surgical colleagues. Under such circumstances one could confidently predict a cure in a very large proportion of cases, with comparatively slight operation risk, and until these cases can be diagnosed at a much earlier period, it is highly desirable that recourse should be had to an exploratory operation in all doubtful cases.

Billroth did the first successful gastric resection twenty-nine years ago.

Read before the Surgical Section of the Academy of Medicine, Buffalo, April 4th, 1911.

In 1839 Cruveilhier first described ulcer, distinguishing it from cancer, and suggested the possibility of the development of cancer upon the base of an ulcer. In 1840 Rokitansky also expressed the opinion that the one condition might be implanted upon the other.

In 1848 Dittrich reported six cases of cancer developing in the immediate vicinity of an active or healed ulcer, two of association of cancer and ulcer, and two of circumscribed cancer in the margin of an ulcer.

In 1878 Lebert stated that cancerous transformation occurred in 9 per cent. of ulcers, while Zenker, in 1882, believed that all cases of gastric cancer were secondary to ulceration. Subsequently Hauser, in 1883, attributed the transformation to glandular malformation resulting from inflammatory or cicatricial processes, which favoured epithelial proliferation, and first drew attention to the persistence of free hydrochloric acid in such cases. In 1888 Rosenheim's results indicated that in primary gastric carcinoma the mucous membrane was almost invariably atrophied, while he found that in a case of malignancy engrafted upon ulcer it was normal throughout. A year later he reported fifty-six cases of cancer, four of which were secondary to ulceration, and in all of these four cases free hydrochloric acid was present. He therefore concluded that its persistence indicated that the cancer had developed upon ulcer. In 1889 Watzoldt reported a case of pyloric stenosis, in which post-mortem examination revealed an ulcer of the lesser curvature, with malignant transformation in one of its margins, and involvement of the neighbouring lymphatic glands. In 1902 Fuetterer concluded, as a result of very extensive researches, that carcinoma develops with great frequency from pyloric ulcer, but that such a transformation is much less common in ulcers in other parts of the stomach.[1] On the other hand Osler[2] in his book on "Cancer of the Stomach," says that in only four of 150 cases examined was there a history of ulcer. There is, indeed, considerable variation in the estimates of various authors as to the frequency of this transformation. Zenker believes that practically all cases of carcinoma are secondary to ulcer, while Heberlin, Fenwick, Plange, and Berthold, give the proportion as only 3 per cent. D'Arcy Power[3] believes that carcinoma is nearly always secondary to chronic ulceration, develops slowly, and is localized for a considerable time to its site of origin. Secondary growths are unusual and glandular enlargements in the neighbourhood may show no epithelial deposits.

The most recent statistics give the highest percentage of frequency. Klausa, 1891 to 1900, in 120 cases, in which the diagnosis was confirmed by pathological examination, found that 26 per cent. had developed from ulcer. In 1906 Moynihan reported 58 cases of cancer, and of the last 22 of these a history of chronic ulcer was given in 16. In one case the attack occurred twenty-six years previously, and the patient had since been in good health. Since 1906 he has reported one hundred further cases with practically the same percentage, so that of all his cases two in three, 72·1 per cent., had a history of ulcer.[4] Sapeshko, in one hundred cases, found ten only which had not originated in peptic ulcer, and he reports cases of pyloric carcinoma developing five or six years after operations for ulcer. Mayo Robson calculates the frequency at 60 per cent., Mansell-Moullin at 90 per cent. On the other hand, Borrmann states that in 63 patients operated upon at Mikulicz's clinic, he was able to demonstrate the existence of previous gastric ulcer in only one case. Küttner[5] believes that there is undoubtedly a causal relationship, but that the frequency has been slightly exaggerated by some writers. He is of opinion that operation should be undertaken in all cases of gastric ulcer, and believes that this would reduce the mortality of gastric carcinoma.

In 1909 Wilson and MacCarty[6] reported the results of the examination of specimens from gastric and duodenal resections for ulcer and carcinoma, obtained from the Rochester clinic between January, 1905, and April, 1909, in all two hundred and eighteen cases, one hundred and fifty-three of these being undoubted carcinoma. Of these cases, one hundred and nine, or 71 per cent., had evidently developed upon ulcer, five other cases were possibly transitional, and eleven others showed considerable evidence of the previous existence of ulcer. The one hundred and nine cases exhibited large ulcers with overhanging margins, deep in the bases of which cancer was present. The growths had almost invariably started upon the lesser curvature, the usual site of gastric ulcer, and in practically every instance the clinical history suggested the persistence of ulcer for a long period of years previous to the development of the carcinoma. The following pathological conditions were observed in the specimens:

1. Chronic ulcers, from the centres of which the mucosa had disappeared, leaving a base of scar tissue. 2. Proliferation of mucosa in the overhanging margins of the ulcers. 3. Deep in the margins of the ulcers were many groups of epithelial cells nipped off by scar tissue, and exhibiting all stages of aberrant proliferation,

with infiltration of surrounding tissues. 4. Metastases forming in the lymphatics of the gastric wall and adnexa.

In 1910 Wilson and Willis[7] reported the results of pathological examination of specimens from one hundred and eighty-nine cases of cancer of the stomach, also obtained from the Rochester clinic. At no point within the alimentary canal was there any indication that superficial irritation, however prolonged, ever results in the development of carcinoma, but it appears to be a *sine qua non* that portions of the epithelium should be displaced from their normal relationship, and 70 per cent. of all these cases of gastric cancer gave satisfactory microscopical evidence of this. Both the clinical and microscopical appearances indicated that in a very large proportion of cases carcinomata develop upon epithelial cells previously isolated from their normal surroundings, and it therefore appears that within the alimentary canal the presence of such isolated tissue is essential for the development of the specific irritant of carcinoma. On the other hand, however, there is no doubt that many cases of cancer of the alimentary canal have developed without such previous epithelial isolation, and Wilson and Willis report one such case. As far as can be ascertained, however, the relationship between carcinoma and ulcer is that in many chronic ulcers there is segregation of epithelium, upon which carcinoma may develop, and the majority of cases of cancer exhibit this preliminary epithelial isolation.

Gastric cancer is especially likely to develop in the callous and tumour-like varieties of ulcer. Payr[8] found that by the injection of attenuated formalin, alcohol, or concentrated or heated saline solutions into the gastric vessels, ulcers could be produced which, in the course of time, approximated to callous or tumour-like growths, and finally exhibited characteristics resembling those of the circular gastric ulcers occurring in man. Histological examination of ulcers obtained by excision or resection showed cancerous transformation in 20 per cent., the callous form appearing to be especially predisposed, and a microscopical distinction between callous ulcer and carcinoma not being easily made.

According to Adami's classification,[9] we may correctly designate the majority of gastric carcinomata as "blastomas originating from unipotential cells of post-natal displacement," although it is probable that a very small proportion are "blastomas originating from unipotential cells that assume neoplastic characters without displacement, and rapidly become malignant." Conclusive patho-

logical evidence of the connexion of cancer and ulcer can of necessity be obtained only at a time when the primary and the cancerous disease are found together at operation.

THE IMPORTANCE OF A TUMOUR. It is, unfortunately, the habit of many physicians to wait until a tumour can be felt before making a definite diagnosis of cancer. I find, on referring to the statistics of various authors, that a tumour can only be made out in a little over 50 per cent. of operable cases. It is quite clear, therefore, that no case can be considered as non-malignant because a tumour is absent. On the other hand, a case should not be considered inoperable because a tumour is present. We must be careful not to mistake a contracted rectus muscle, or a tonic contraction of the pylorus and antrum pylori, or of the whole stomach, due to ulcer, for a growth in the stomach.

All observers are now practically agreed that the chemical examination of the contents of the stomach is not of much value in diagnosis, but the results of repeated analyses may afford important confirmation of the malignity of the condition. Examination of the gastric contents in the early stages means nothing, and the presence of the Oppler-Boas bacillus indicates simply stagnation of food within the stomach and its fermentative destruction. The characteristic result in cancer is absence of free hydrochloric acid, diminished total acidity, and the presence of lactic acid and of the Oppler-Boas bacillus. In a few cases, however, free hydrochloric acid is normal in amount, and its absence and the presence of lactic acid are not specific. On the other hand, an increased hydrochloric acid content is fairly conclusive for ulcer, and a postive finding as regards lactic acid does not negative it. Boas, however, considers this presence of lactic acid as pathognomonic of carcinoma.

A normal content of hydrochloric acid is especially likely to be present if the cancer is developing upon an ulcer. Hertz[10] emphasizes the importance of occult blood in the stools, as minute hæmorrhages are constantly occurring from the surface of every malignant ulcer. The best tests for ascertaining this are the guaiacum and benzidene reactions, made with ethereal extracts of stools after treatment by glacial acetic acid. In two hundred and sixty-six cases in which these tests were applied 99 per cent. gave a positive reaction.

THE VALUE OF THE *X*-RAY IN THE DIAGNOSIS OF TUMOURS OF THE STOMACH. For years Rœntgenologists have been photographing the stomach by what is known as the bismuth method, that is to say, they administer an ounce or two of bismuth, suspended

in solution, and immediately take an *x*-ray of the stomach, and they claim that by this method they can distinguish the presence of a growth. In a recent paper, Cole and Einhorn[11] advise the inflation of the stomach with air by inserting a tube, and injecting air with a Politzer bulb. Cole uses this because there are disadvantages in the use of the bismuth solution, in that it occasionally causes poisoning, and the shadow due to the bismuth may obscure that due to a tumour. They have used inflation a number of times with satisfactory results, but they do not suggest that it should replace the bismuth method, but that it should be used in conjunction with it, or if, for any reason, bismuth cannot be employed. Holtzknecht[12] uses the bismuth method, and states that the presence of a tumour is indicated when (a) there are vacant spaces or defects in the contour of the mass in the stomach; (b) when there are abnormal boundaries of the mass; (c) when there are irregularities of peristalsis. If the tumour cannot be palpated, the demonstration of visible peristaltic waves from left to right is of importance, and still more so is that of peristalsis in the opposite direction.

As regards the diagnosis of disease of the stomach from abnormalities of peristalsis, it is a well-recognized fact that the most common site of carcinoma is at the pyloric end, where the peristaltic waves are strongest, and therefore most likely to be affected by induration of the stomach. In advanced cases, with extensive adhesions, the peristaltic wave is arrested at the site of the tumour. The diagnosis is most certain if the wave can be followed to the tumour, where it stops completely, and can be seen to begin again on the opposite side of the tumour. This is observed in cases in which the disease affects one curvature only.

In the presence of pyloric stenosis the waves are often unusually deep and frequent for a time, and may then cease entirely for an indefinite period, or reversed peristalsis, to which attention was first directed by Jonas[13] and Holtzknecht, may be observed. The latter is characteristic of pyloric obstruction. When only one curvature is involved, the wave on the opposite side is apt to be deeper than normal, this being compensatory, and Pfahler[14] believes that in such cases an induration, an inch or less in diameter, should be recognizable, and that careful study of peristalsis will in future afford the earliest possible evidence of the existence of cancer of the stomach.

The difficulty of diagnosis is a strong argument for exploratory laparotomy. It should be advised in all cases of gastric obstruction, stasis, or chronic ulcer, as it is the only means of making a positive

diagnosis, and when cancer is found its removal may be accomplished at an early stage. Undoubtedly the unfavourable results obtained from operation in gastric cancer are due to the lateness of diagnosis. There is no doubt that the test meal is a great source of delay, and is of doubtful value. The mortality of exploratory laparotomy may be regarded as nil, and it possesses the great advantage of permitting of radical removal of a small carcinoma without glandular metastases at a time when the general condition of the patient is good.

In this connexion it should be borne in mind, however, that an exploratory operation does not invariably clear up the diagnosis, and cases have been reported in which a hard mass has been regarded as malignant and inoperable, and the subsequent recovery of the patient has proved it to be inflammatory. Cases of this nature are found in the publications of Lilienthal, Wolfler, Paterson, and Kindle, and I have myself reported one case.

Miss S. G., aged thirty-nine. Sent into the Toronto General Hospital on November 17th, 1900, under my care by Dr. Burritt. For the last ten or twelve years she had suffered from attacks of pain in the right hypochondriac region, diagnosed as biliary colic. Being a trained nurse, she was seen by a number of doctors, all of whom attributed these attacks to gall-stones. Nausea and vomiting were always associated with them, and she found it necessary to be careful in regard to her diet. She was engaged in nursing a case of typhoid, and when walking home from her patient's house one day she had a sudden attack of severe pain in the region of the gall-bladder, accompanied by faintness, and with difficulty continued her walk home. She rested there for two or three hours, and then returned in a cab to her patient's house and went on duty. As her stomach had been bothering her for some little time prior to this, she had been taking malted milk in small quantities. When Dr. Burritt, who was attending the typhoid patient, found the nurse suffering from pain, he had her leave the case, and sent her into the General Hospital.

I saw her the following day, and on examination felt an enlargement about the size of a Tangerine orange just below the ninth costal cartilage on the right side. It was slightly movable from side to side and dull on percussion, the dulness being continuous with that of the liver. As she was now free from pain, and thinking that she had an enlarged gall-bladder filled with gall-stones, and as it was Saturday, we decided to defer operation until Monday morning, that is to say seventy hours after the onset of severe pain.

On opening the abdomen, a mass was found the size of a Tanger-

ine orange, involving the anterior wall of the stomach close to the pylorus, and with a perforation in its centre large enough to admit a small lead pencil. There was a slight amount of plastic exudate around the opening, and a little exudate was also found on the parietal peritoneum of the anterior abdominal wall, against which this perforation evidently pressed. This, together with the fact that she had taken such small quantities of malted milk for some days prior to perforation, with the consequent emptiness of the stomach, undoubtedly accounted for the absence of stomach contents in the peritoneal cavity. The mass, which was very hard, was situated midway between the curvatures, and its margin on the pyloric side extended to within one inch of the pylorus. The mass was circular and about two and a half inches in diameter, and one and a half inches in thickness. It seemed most probable that the tumour was a carcinoma. However, as the patient was not prepared for so severe an operation as resection of the stomach for carcinoma, and as there was some doubt as to the growth being malignant, it was thought advisable to remove a section for microscopic examination, after which the opening was closed by Lembert sutures.

On section the growth proved to be inflammatory, containing a large amount of fibrous tissue. It was therefore clear that the patient had suffered from gastric ulcer, which had perforated in spite of the enormous thickening which surrounded it. She made a good recovery, and has since been continuously occupied at nursing. Three years ago I removed her uterus for large fibroids. I spoke to her a few days ago, and she is still nursing and in good health, but suffers considerably from hyerchlorhydria.

Welch states that 21·1 per cent. of all cancers occur in the stomach, Virchow, 35 per cent., and others, 40 per cent. In more than half the cases the malignant growth originates in the pylorus and the lesser curvature adjacent to it, in 30 per cent., in the body, and in 10 per cent., in the cardia. The most hopeless cases are those involving the body, posterior wall, and cardia, as growths in these situations may attain a large size without becoming palpable. The presence of a small pyloric tumour may be fairly favourable, although until recently it was believed that the presence of a palpable tumour indicated inoperable disease. The narrower portions of the stomach are seats of election, owing to their exposure to mechanical trauma.

Symptoms. A pyloric and a prepyloric type may be distin-

guished. In the former, vomiting is an early symptom, with gastric dilatation, stagnation, and inability to take either solid or liquid food without discomfort, while in the latter the symptoms are general and constitutional, rather than local. Other important symptoms in this connexion are regurgitation of foul-smelling material and "coffee-ground" vomiting. Küttner is of opinion that obstinate itching of the skin is significant, and that in some instances enlargement of the left supra-clavicular lymph nodes indicates occult carcinoma, while that of the umbilical lymph nodes is not uncommon in the later stages.

Some acute cases begin with severe hæmatemesis, with or without melæna, both of which may be dependent upon multiple hæmorrhagic erosions. The final attack is distinguished from the previous attacks by its lingering character, refractoriness to treatment which has previously been beneficial, repugnance to food, more especially meat, anæmia, progressive loss of weight, often amounting to marked emaciation.

In some cases the first symptom is hæmatemesis, or blood in the stools, but Küttner states that he has observed profuse hæmatemesis as the initial symptom in three cases only, of the large number which he has had to deal with, and that symptoms suggestive of ulcer are much more common. Cases are comparatively common in which cancer immediately follows gastric catarrh, or even appears after it has been apparently recovered from for a long period.

The majority of the cases occur between forty and sixty years of age, but Widerhofen reports a case of congenital carcinoma of the stomach, and the condition has also been observed in a child of five weeks, a boy of fifteen, and a girl of eighteen years of age. It has been said that the onset and persistence of dyspepsia in an individual over forty, who has previously been healthy, probably indicates carcinoma, but Moynihan says that in such cases the lesion is more often benign than malignant, and duodenal rather than gastric.

The disease follows the course of the lymphatics. In addition, hæmatogenous infection may occur in the later stages, or in some instances quite early, by way of the gastric or other veins, and a rapidly growing carcinoma of the liver may be present before the gastric carcinoma has become palpable or produced definite symptoms.

As gastric cancer in the early stages is a localized disease, which can be removed with good immediate and remote results,

treatment by operation should be more commonly adopted. In view of the frequent development of carcinoma upon the base of an ulcer, resection should be considered immediately if an ulcer is suspected to be of a malignant character, and this applies particularly to severe callous ulcers, more especially if they involve other organs, such as the liver and pancreas.

OPERATION. The only contra-indications to operation are immobility of the tumour, ascites, and the presence of cancerous adhesions. On the other hand, inflammatory adhesions due to perigastritis do not contra-indicate surgical interference. The methods of operation chiefly employed in dealing with cancer of the stomach are Billroth's Method I, Billroth's Method II, and Kocher's operation. Billroth I is especially appropriate to benign tumours, and Billroth II has given better results than Kocher's operation, which is employed only in early cases. Billroth I consists of the implantation of the duodenum in the gastric wound, Billroth II of closure of the duodenum and stomach with gastro-enterostomy, and Kocher's operation, of implantation of the duodenum in the posterior wall of the stomach.

The mortality of gastric resection was, at first, from 50 to 60 per cent. According to Clairmont the mortality between 1900 and 1905 varied between 16·7 per cent. and 68 per cent., for the various operations, the average being 34·4 per cent. Von Mikulicz reports 62 cases which came under observation between 1900 and 1904, with a mortality of 33·8 per cent. In 1909 Délore and Alamartine[15] reported 43 cases in which resection was performed, with a mortality of 32·5 per cent. Poncet, Délore, and Lériche,[16] report 40 cases of resection, with 35 per cent. mortality. Lériche's recent statistics show a mortality of only 25 per cent. Kocher[17] has reduced his mortality to 17 per cent., and in skilled hands in early cases the immediate mortality should not exceed 20 per cent., with a possibility of still further reduction by improved methods of diagnosis. Payr states that in a collection of about five hundred excisions and resections it amounted to only 10 per cent. In October, 1905, Mayo reported eighty-one resections, and has since published thirty-four cases with a mortality of 8 per cent., and twenty-five with a mortality of 5 per cent.

When considering the mortality of gastric resection, it should be borne in mind that the mortality under medical treatment without operation is 100 per cent. The following statistics in regard to the mortality in the various methods of resection have been collected from the publications of the following writers :

Von Hacker, Mayo, Hartmann, Kappeler, Maydl-Jedliczka, Krause, Kocher, von Mikulicz, Caspersohn, Moynihan, Poncet, Délore and Lériche, Czerny, Spassokukotsky, von Eiselsberg, Garré, Brünner, Krönlein, Burkhardt, Roux, Brenner, Gussenbauer, Kümmell, Délore and Alamartine, Boeckel, Groves, Tixier.

Method of Operation	No. of Authors	No. of Cases	Deaths	Percentage of Mortality
Billroth I.....	11	279	102	36
Billroth II.....	9	189	77	40
Kocher.....	3	54	14	26
All Methods.....	25	804	340	42

The immediate mortality is much less when the operation is done in two stages, and I would therefore strongly advocate a preliminary gastro-enterostomy. This method gives a much larger proportion of cures, and in six cases reported by Groves[18] there was not one fatal result. Many other surgeons also recommend a two-stage operation, consisting of preliminary gastro-enterostomy, with resection three weeks later. Radical operation should not be undertaken if there is any doubt as to whether resection wide of the disease can be performed.

The minimum operation consists in the removal of two-thirds of the stomach, that is to say the lesser curvature, half the greater curvature, an inch at least of the duodenum, and all the primary glands, including the lower and upper coronary, right paracardial, supra-pyloric, right supra-pancreatic, upper and lower right gastro-omental, and retro-pyloric. In advanced cases the transverse colon and great omentum should be removed. Between April, 1897, and May, 1910, Mayo[19] operated upon two hundred and sixty-six cases by partial gastrectomy and pylorectomy, with a mortality of 12·4 per cent. the usual procedure being closure of both ends, together with posterior gastro-enterostomy.

Indications for Operation. If exploratory laparotomy reveals a freely movable tumour of the gastric wall, gastro-enterostomy should be performed, as it is the best treatment for ulcer and the only hope for cancer. Resection is contra-indicated if the mass is extensively adherent and there is no certainty that it is cancer, owing to the fact that posterior gastro-enterostomy will afford relief if it is ulcer, whilst adherent cancer is practically hopeless. Mikulicz found adhesion to neighbouring organs in forty-six out of one hundred and sixty-three cases, usually to the pancreas, and in three only to the liver. Adhesion to the liver is not a contra-indication to radical operation, as it was present in

two of Mikulicz's patients who survived the operation two years. All tissues involved in the cancerous process should, if possible, be removed.

Remote Results of Operation. The average duration of life after resection has been computed at fifteen months and twenty days. Mr. Groves has collected one hundred and twenty-seven cases in which the cause of death after resection is given. These cases are reported by Goldschwend,[20] Rasumowski,[21] Müller,[22] Branham,[23] Frazier,[24] Bishop,[25] Brünner,[26] Carré,[27] Krönlein,[28] Steinthal,[29] Czerny,[30] Körte,[31] Graham,[32] Makkas,[33] and Mizochuchi.[34]

The following table gives an analysis of the cause of death in the above cases:

Peritonitis (including leakage or leakage from duodenal stump)	79	cases.
Heart Failure, Shock, Collapse, Weakness, Marasmus, Narcosis	23	"
Pulmonary complications, especially pneumonia	20	"
Hæmorrhage	2	"
Septic Cholangitis	1	"
Brain Symptoms	1	"
Colitis	1	"

It will thus be seen that about two-thirds of the cases died from peritonitis, and of the remaining third, half died from shock and half from pulmonary complications.

Paterson[35] states that there is a probability of permanent cure in about 12 per cent. of the cases operated upon. Death from recurrence usually takes place within three and a half years. The prognosis after extensive removal is as follows: Recovery from operation, 85 per cent., living three years without recurrence, 20 per cent. In analyzing his cases of cure, Kocher found that the freely movable tumours were mostly situated at the pylorus; all but one were adeno-carcinomata, many of the colloid type, and only one was a scirrhus. Recurrence is most likely to be avoided by removal of the lymphatic glands which may be involved in the cancerous growth, but Mr. Groves does not believe that the removal of the lymphatics along the greater and lesser curvature, even when combined with that of certain glands upon the anterior surface of the pancreas, is sufficient, and therefore as a routine measure he also removes the greater portion of the great omentum.

Makkas made enquiries about one hundred and five cases in which resection was performed between 1891 and 1904 at the Mikulicz clinic, and obtained reports from ninety-two. Sixty-five of the patients had died at the beginning of 1906, but three only died from recurrence. In most of the cases death occurred in the first or second year after operation, six in the third year, three in the fourth, two in the fifth, and one in the sixth. The average length of life of the patients with recurrence was eighteen months and nine days in Mikulicz's cases, eighteen months in Krönlein's, eighteen months and ten days in Kocher's, twenty months in Körte's, and twenty-six months in Roux's cases. Küttner states that many patients live for years without recurrence, and that as a rule permanent cure may be assumed if the patient remains free for three years, although in one case he has observed recurrence five years after operation.

At the time when Makkas received the report, twenty-seven of the ninety-two cases were apparently free from recurrence, and seventeen of these had been operated upon more than three years previously. Kocher has done one hundred and forty gastrectomies for cancer, and twenty-five of these patients are living without recurrence. If ten cases operated upon less than three years ago, are deducted from these, and also seven which died from intercurrent affections without recurrence, there are 20 per cent. of cures persisting for more than three years. In thirteen cases, which have remained cured for more than four years, the functional results are perfect, and digestion and nutrition normal. After operation the stomach contents showed absence of free hydrochloric acid, but normal albuminoid digestion. Kocher has reported one case which was perfectly well seventeen years after resection, and another twelve years after. Bircher reports one which re-remained well fifteen and a half years after operation. Mikulicz, Czerny, Körte, etc., have observed freedom from recurrence twelve, nine, eight, seven, six, and five years after operation.

In 1909 Poncet, Délore, and Lériche reported one hundred and sixty-nine cases of gastric cancer, in forty of which resection was performed, with an operative mortality of 35 per cent. The procedure employed was, in all instances, Billroth's Method II. Seven, or 34 per cent., survived more than a year,—sixteen months, twenty months, twenty-seven months, three years and six months, five years and ten months. In 1909 Goldschwend reported a case which had remained without recurrence for eight years. In Murphy's collection of one hundred and eighty-nine cases, seventeen,

or 8 per cent., lived three years after operation, and Ratimoff[36] has reported one which lived for ten years without recurrence. Mikulicz states that of seventy-one cases which recovered from operation, twenty-two lived more than two years. Of the one hundred and seventeen cases reported by Délore and Alamartine, the remote results were known in eighteen. Five, or 27 per cent., died from recurrence or generalization during the first year, seven from recurrence in an average of twenty months, and six have remained well for more than a year, including one patient who has been free from recurrence for three years and eight months, and one who has been free for six years. In 1910 Boeckel[37] reported seventy-six cases which had come under his observation during the last ten years. The radical operation was performed in eleven cases, nine-tenths of the stomach being removed. Seven were completely cured. Two of these have died from intercurrent affections, and the others are perfectly well seven years after operation. In 1910 Mayo reported two hundred and sixty-six cases of partial gastrectomy and pylorectomy. Thirty-nine of these cases were still living five years after operation, sixty-four were living four years after, and eighty-eight were living three years after.

If, on account of the extent of the disease, gastro-enterostomy only can be performed, there is, in most cases, recovery from the immediate effects of the operation, but the average length of life is only six months. I have performed gastro-enterostomy in twenty cases, and it has been followed by a great degree of comfort in practically every instance. In the majority of cases the patients stated that they felt as good as ever, that their digestion was as good as it ever was, and that they had been perfectly comfortable since the operation. They continued in this condition for some months, and until near the fatal termination. So that, even though life is prolonged for such a comparatively short period, I am of opinion that it has been quite worth while to give these patients this small respite from suffering. Several of my cases lived a year after operation. In some cases the operation affords but little relief, but there is generally marked improvement, and Küttner reports instances in which the patients lived in comparative comfort for one, two, and even three years after its performance. He believes that it is only justifiable as the first stage of a radical operation, or when the radical procedure of resection is regarded as too severe or utterly impracticable. The mortality is estimated by Payr as 3·5 per cent.

In regard to my own statistics in operations for cancer of the stomach, I have not had a sufficiently large number of cases to make them of much value. Altogether, I have operated on about fifty cases of cancer of the stomach. Of these, twenty-two cases were in too advanced a stage of the disease for any operation. In twenty cases a gastro-enterostomy was done, with two deaths, and in six cases a partial gastrectomy was done, with two deaths. I should like to refer to a few cases of special interest

W. M., aged fifty-four, referred by Dr. C. J. O. Hastings, gave a history of ulcer dating back for one year, with loss of weight from one hundred and eighty to one hundred and twenty-six pounds. The growth involved the pyloric end, lesser curvature, and part of the body of the stomach. A two-stage operation was done, posterior gastro-enterostomy being performed in the first place, and ten days after this he left the hospital, when he was taking his ordinary meals. Four weeks after the operation he had gained twenty-seven pounds.

The second operation of gastrectomy was then performed. Two-thirds of the stomach were removed, including about an inch of the duodenum, and the glands along the lesser curvature and greater curvature. About a week later he developed a duodenal fistula, which discharged a large quantity of bile. Two weeks later the wound was re-opened, and the duodenum sewn over very carefully. It was very soft and friable, and it was difficult to get the stitches to hold. About two weeks later the bile again discharged through the wound, but in six weeks the fistula had closed completely. The operation was performed on January 18th, 1910. It is now a year and four months since the operation, and he is in good health, and eats fairly large meals with normal digestion, although he has only a very small stomach left. There is no evidence of recurrence.

Mrs. D., aged forty-seven. I was called to Oshawa by Dr. Ford to operate upon her. There was no history of ulcer or vomiting of blood. The present symptoms appeared about three months prior to the time when I first saw her, when there was considerable emaciation. She had well marked pyloric obstruction, and vomited everything that she took, either two or three hours after eating or after a second meal. One could feel a mass in the region of the pylorus.

At the operation a very large mass at the pyloric end of the stomach was found, involving about three inches of the anterior wall of the stomach next to the pylorus, as well as about two and

a half inches of the posterior wall of the stomach. The glands along the lesser and the greater curvatures were enlarged. The tumour was easily movable. I decided to do a two-stage operation, and accordingly a posterior gastro-enterostomy was done. She made a nice recovery, left the hospital in two weeks, and returned to the hospital in four weeks, having gained thirty pounds in weight. I then did resection of the stomach, removing an inch of the duodenum and about half of the stomach; namely, all of the lesser curvature and nearly half of the greater curvature, together with a number of enlarged glands along the lesser and the greater curvatures. These glands were quite hard, and were, we thought, undoubtedly carcinomatous, but on section they proved to be inflammatory, and the mass in the stomach consisted chiefly of fibrous tissue. There was a small patch on the anterior wall, the size of a ten cent piece, which was carcinomatous.

Plate A is a drawing of the stomach, showing the situation of the carcinomatous degeneration at c.a., and the shadow shows the portion of stomach greatly thickened with fibrous tissue, the dotted line indicating the line of section of the stomach. Plate B is the portion removed cut open, showing a probe through the pylorus, which is only large enough to admit it, and c.a. indicates the site of the carcinoma. The small picture above shows the size of the pylorus. Plates C and D are sections through the growth. These plates will give an idea of the extent of the growth and the site of the carcinomatous degeneration. The two microscopic sections show very well the epithelial cells breaking through the basement membrane, and the cancer invading the muscular wall of the stomach. Dr. O. R. Mabee, pathologist to the General Hospital, who made the sections, reports as follows: "The pylorus is thickened, firm, and indurated. Its lumen is much narrowed, and admits only a very small probe. Its mucous membrane is smooth and continuous with that of the stomach. Just within the stomach, on its anterior wall, there is a small ulceration, measuring 2 cm. in diameter. Its edges are raised and indurated, and the stomach wall surrounding them is moderately thickened. Microscopic examination of sections through the pylorus shows a large increase in the connective tissue of the submucosa and of the muscle, with irregularly distributed areas of infiltration by small mononuclear lymphocytes. The mucosa shows moderate atrophy of glandular tissue, and the submucosa shows slight chronic inflammatory changes. Sections through the margin of the ulcer show a typical glandular proliferation, the cells of which

in some areas break through their basement membrane and invade the submucosa and muscle. These cells are generally columnar in type, and contain numbers of mitotic figures. Anatomical diagnosis: adeno-carcinoma, gastric ulcer, chronic interstitial gastritis, pyloric stenosis."

Although the patient gave no history of ulcer, it would appear most probable that the disease began with ulcer, and that the large amount of fibrous thickening present was due to inflammation around this ulcer. Inasmuch as the area affected was so small in extent, and the glands not being involved, it seems likely that the patient will be permanently relieved. Eight months have now elapsed since the operation, and she is apparently in good health, doing her usual work about the house, and her husband states that she eats more than he does and has perfect digestion. Two other cases are living, a year and half a year, respectively, since operation, and two have died.

Another case in which a tumour could not be felt, is that of G. B., aged forty-seven. He had been ailing for two years, with a history of ulcer. The stomach contents were examined a number of times, and always showed excess of hydrochloric acid, so that it seemed quite clear that he was suffering from gastric ulcer. Within one week of the time I operated upon him, examination of the gastric contents showed excess of hydrochloric acid. At the operation we found the lesser curvature and anterior and posterior wall of the stomach involved in a carcinomatous mass, the mass being saddle-shaped, and extending, also, up to and involving the cardiac end of the stomach. The glands of the lesser curvature were all involved, and several along the greater curvature. The growth extended up into the gastrohepatic omentum. It was also adherent posteriorly to the pancreas. I made an attempt to remove this mass, and succeeded in separating the growth from the pancreas by shaving off a portion of the pancreas, as well as dividing the gastro-hepatic omentum above the growth, but on account of the extension of the growth beyond the cardiac end into the œsophagus I decided not to persist further with its removal. The patient recovered from operation, and is still living, and in fact feels somewhat relieved. Plate B will give an idea of this case.

F. G. E., aged forty-five, had suffered from stomach disorder for three years. Symptoms of gastric ulcer had been present for the last six or eight months. A large tumour was palpated. It was clearly an inoperable case, but as he had almost

constant vomiting, not being able to eat any food, it was decided to do a gastro-enterostomy. On account of the extent of the growth we were obliged to do an anterior gastro-enterostomy. He recovered nicely from the operation, but vomiting commenced again, and became very persistent, in fact a vicious circle was established, and in order to relieve it we submitted him again to operation, doing an entero-anastomosis. He only vomited once after this, evidently from the anæsthetic. He obtained perfect relief, ate better than he had done for months, although two-thirds of his stomach were infiltrated with cancer, and was quite comfortable until his death about three months later.

This case, and others of a similar character, cause me to recommend strongly a gastro-enterostomy in cases of inoperable cancer involving the pylorus, even though life is only prolonged a few months, for the patient is made comfortable, and life, even if not actually enjoyable, is made bearable.

Conclusions

1. The mortality after resection, computed from the statistics of the recent work of several of the leading surgeons, has been reduced to 20 per cent., and is due in two-thirds of the cases to peritonitis, and in one-third to shock and pulmonary complications, in about equal proportions.

2. The immediate mortality is much less when the operation is done in two stages, and I therefore strongly favour a preliminary gastro-enterostomy.

3. Cases in which the colon, pancreas, or posterior lymphatics are seriously involved, should be considered inoperable.

4. In order to give the best chance of freedom from recurrence, there should be adequate removal of associated lymphatic areas, together with the tissues in front of the pancreas.

5. It is to the physicians that we must look for any further improvement in the immediate and remote results in operation for cancer of the stomach, for with the perfect technique now employed, surgeons have more than done their part, and it now but remains for physicians to improve their diagnostic acumen sufficiently to enable them to refer these cases for operation at an early stage of the disease.

See page 831 for References.

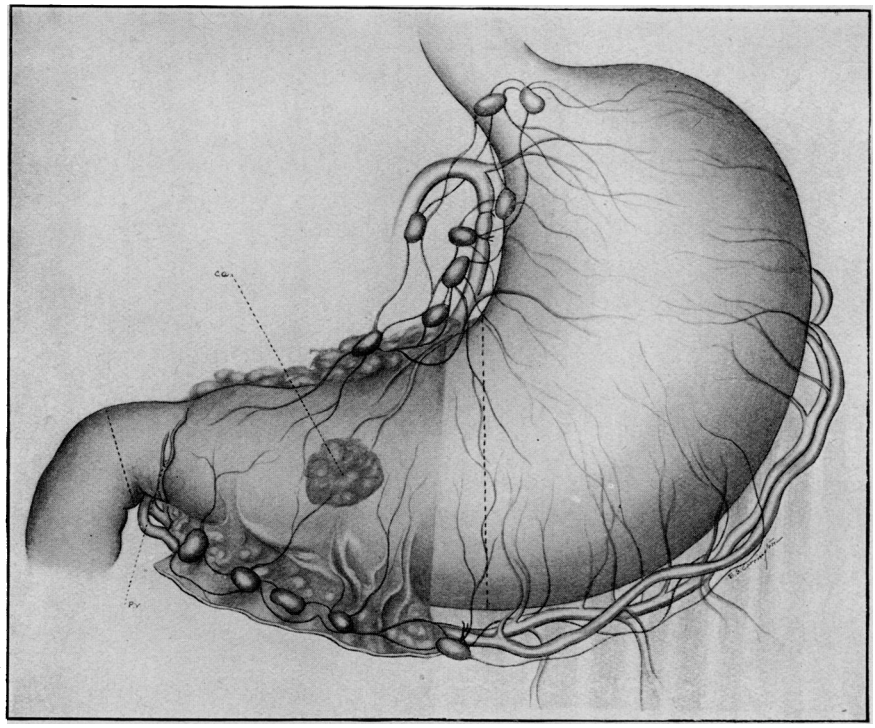

Plate A.—Illustrating Dr. Bruce's Article.

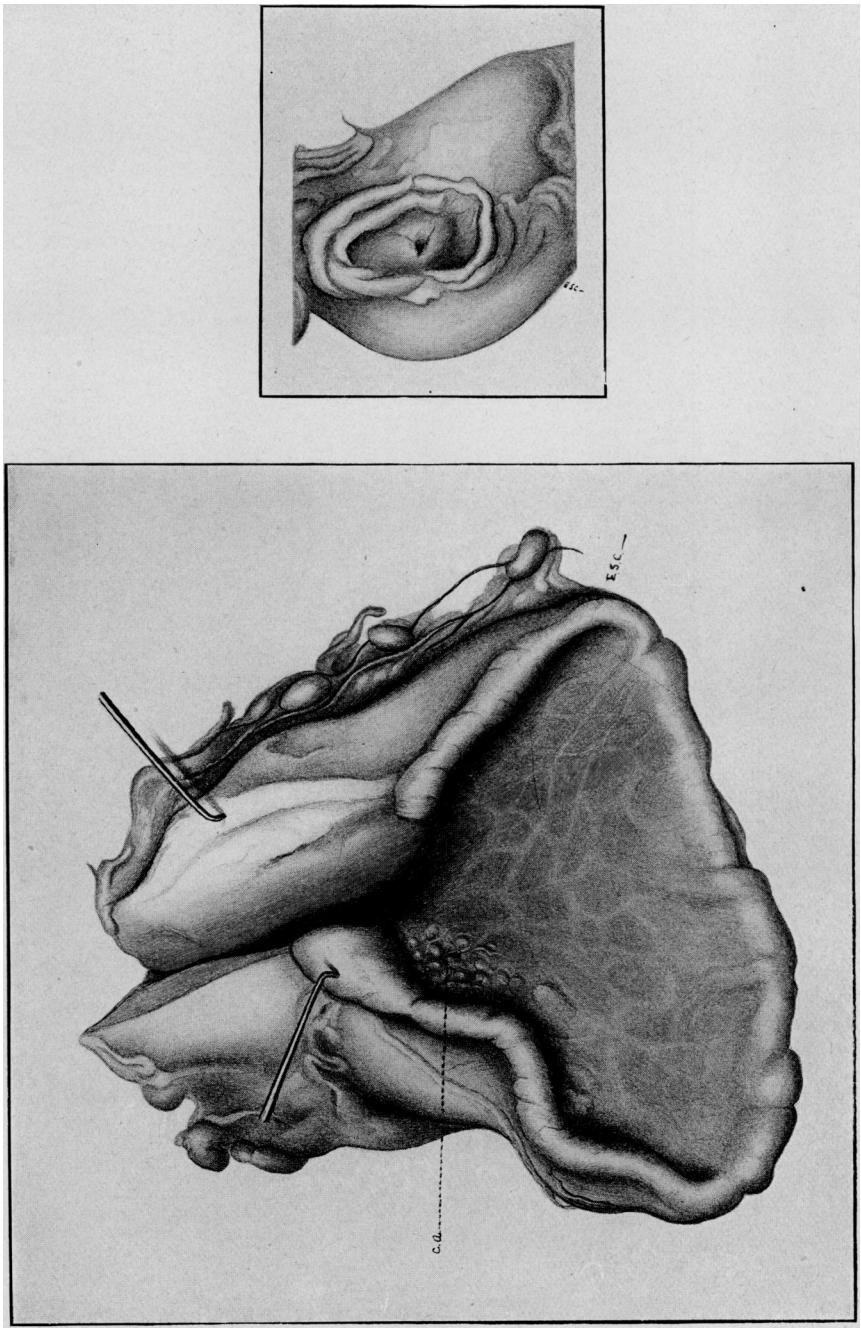

Plate B.—Illustrating Dr. Bruce's Article.

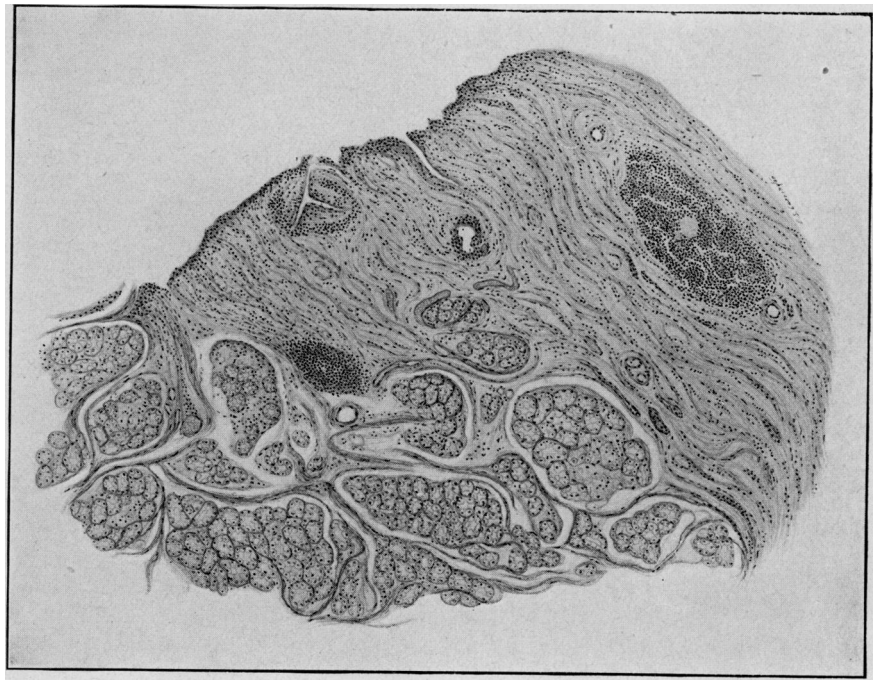

Plate C.—Illustrating Dr. Bruce's Article.

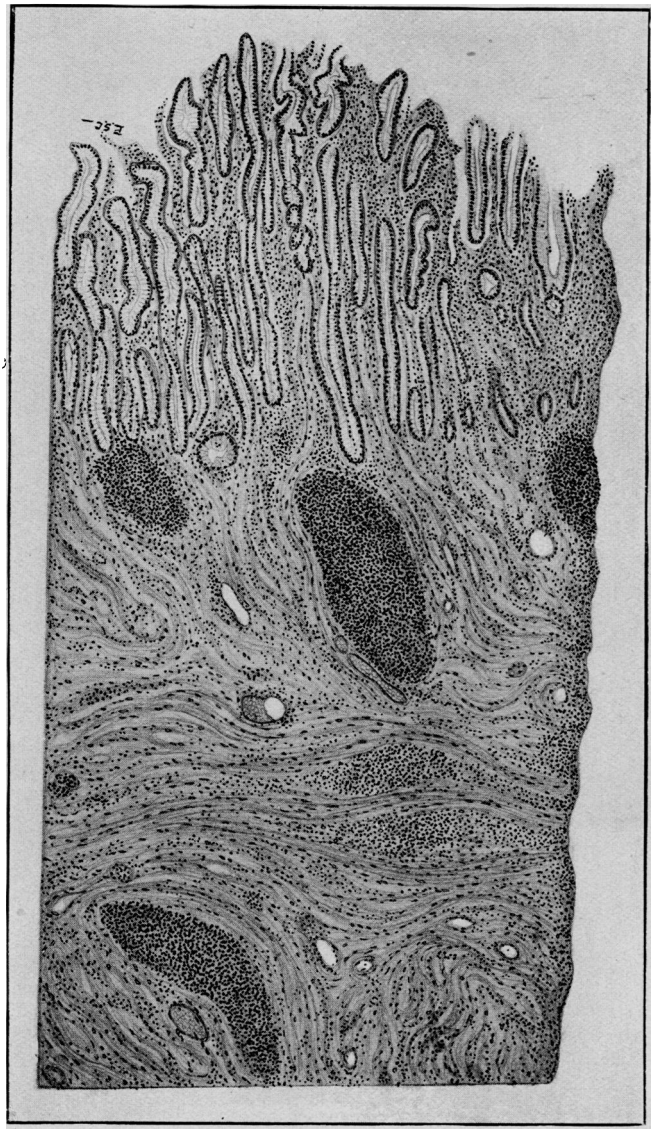

Plate D.—Illustrating Dr. Bruce's Article.

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