lymph was wiped off, but no perforation was present; although from the appearance of the ulcer it seemed imminent. The affected area was buried by means of Lembert's sutures. There was a free amount of peritoneal fluid, but it was clear. The case terminated fatally in twenty-four hours from pneumonia.

Dr. John B. Roberts said that increase in respiration was an important point. A sudden increase of respirations to 30 or 36, accompanied by pain in the abdomen, probably means perforation.

Dr. Harte, in closing, said that as regards cocaine he had never used it, but believed there was no doubt of its value in the hands of some surgeons. The time of recognition of the condition and the time of operation cannot be too close together, and but little time can be spent in making the toilet, which should be simple but thorough. One must get the patient off the table and into bed if any reasonable percentage of cases are to be saved. No one definite rule as to the manner of stitching the intestine can be followed, as this should be determined by the character of the perforation. It is less apt to tear when closed longitudinally. The leucocyte count is of no value, being only misleading in cases of perforation. Localized abscess is possible only when the lesion is associated with the appendix, as in typhoid fever the peritoneum does not have an opportunity to form well-marked collections of pus, as are noticed in other peritoneal conditions. After operation for perforation, the patient should be nourished by the bowel for a long time. As to the preperforative stage, there are no symptoms in typhoid perforation until perforation itself occurs; then the whole train of symptoms rapidly follow.

STATED MEETING, MAY 11, 1903.

The President, Richard H. Harte, M.D., in the Chair.

A REVIEW OF THREE HUNDRED AND THREE OPERATIONS UPON THE STOMACH AND FIRST PORTION OF THE DUODENUM.

WITH TABULATED REPORT OF THREE HUNDRED AND THIRTEEN OPERATED CASES.

BY WILLIAM J. MAYO, A.M., M.D.,
OF ROCHESTER, MINNESOTA,
Surgeon to St. Mary's Hospital.

Functionally the small bowel begins at the entrance of the common duct of the liver and pancreas, which about marks the primitive division between the foregut and the midgut (Huntington). The first portion of the duodenum may be said to be the vestibule of the intestinal tract, and its diseases partake more of the character of those of the stomach rather than the intestine. In the large majority of instances, lesions at this point cannot be diagnosticated accurately from similar diseases in the stomach, and are usually due to the same causes. For this reason I have associated all of the cases of this description into a single group for the purpose of study. Total number of cases, 303. Of these 286 are taken from the records of St. Mary's Hospital, Rochester, Minnesota, and the remainder are from the records of the Minnesota State Hospital for the Insane at Rochester and St. Peter. The average age was forty-two; males, 42 per cent.; females, 58 per cent.

Duodenum, twenty-six cases, two deaths, 7.6 per cent. Lesions of the first portion of the duodenum can be divided into two groups; first, those due to ulcer, and, second, those associated with gall-bladder disease.

Ulcer limited to the duodenum was found eleven times,—one acute perforating, two chronic perforating protected by adhesions, five active, and three cicatricial contraction with obstructive symptoms. Two died after operation,—one from pneumonia following excision of the ulcer, one from exhaustion after gastro-enterostomy. In three cases, the signs and symptoms were not to be distinguished from gall-stone disease, and the operation was undertaken under the supposition that the trouble was in the gall-bladder. Five times ulcers existed upon both the duodenum and stomach. Of the sixteen cases in this group, fourteen were in males. The duodenum was frequently associated with gall-stone disease, and usually secondary to it; but in eleven cases the duodenum was the prominent feature. Five were due to gall-stone perforation, requiring intestinal suture. In three of these the gall-bladder was completely separated functionally from the bile-tract, and had become an appendage to the duodenum. Four times, crippling adhesions to the gall-bladder, but without stones or evidence of cholecystitis, were encountered, requiring dissection to loosen,—a periduodenitis of unknown origin. In one case an inflammation of an accessory lobe of the pancreas was the cause of dense adhesions. All but one of the cases in which the gall-bladder was involved occurred in females. There were no deaths in this group. In no instance was the duodenum the seat of primary malignant disease, and in but two cases was there any evidence of extension from pyloric cancer, and then it was not marked. In two patients the diagnosis of lesions originating in the duodenum was made previous to operation. The differentiating features of these cases were, good appetite, delayed pain, general absence of vomiting, and in only one case, and that on one occasion, was there hæmatemesis. In two cases there was evidence of blood in the stool. Otherwise the signs and symptoms were similar to lesions of the stomach or gall-bladder, and, even in the light of operative investigation, points of differentiation did not become evident. Our experience leads us to believe that surgical diseases of the duodenum are much more frequent than has been thought.

The subject of perforating and bleeding ulcers of the stomach has been so thoroughly dealt with by Keen and Foot, Weir, Robson, Rodman, and Andrews, and lesions of a similar character in the duodenum by Weir and Murphy, that it seems unnecessary to dwell upon the few cases which have occurred in this series, and for further information, the classified table appended may be examined at leisure. In the present communication I will discuss briefly the results obtained and some practical deductions based upon two large classes of cases. First, Gastric ulcer and associated causes of serious disturbance. Second, Cancer of the stomach.

Stomach, 277 cases, twenty-eight deaths, 10.1 per cent. In the benign group there are 168 operated cases with eleven deaths (6.5 per cent.), and nearly all of these operations were for chronic ulcer and its late cicatricial results. Included in this class are all of the non-malignant obstructions. The conditions calling for operation were gastric pain with or without acute exacerbations, repeated hæmorrhages, emaciation from inability to retain sufficient nourishment. In a few cases, dilatation due to known or unknown cause gave mechanical reasons for interference.

Without going into the controversy as to the causation of gastric ulcer, there is no doubt that perverted stomach secretion is the most important manifestation in the majority of cases. This is shown by the almost constant association of excessive secretion in ulcer, and the fact that similar ulcers in the duodenum are in that part of the intestine not protected by the alkaline juices poured in through the common duct. In this connection, most interesting information is furnished by those reported cases in which a typical peptic ulcer has developed in the jejunum immediately below a gastrojejunostomy made for the purpose of drainage, the lesion in the jejunum in every particular resembling the original ulcer for which the gastroenterostomy was performed. In operating upon cases of this description, the excessive amount of gastric secretion is constantly in evidence, and the results of drainage operations in relieving the distress and healing the ulcer bear out the importance of this view of the case.

Attempts to classify ulcers of the stomach have been based largely upon post-mortem experience and accidental complications, such as perforation and hæmorrhage. Such classifications tend to exaggerate the importance of fatal complications, which render surgery a desperate resource rather than a well planned effort at cure.

Further surgical observations are necessary to clarify the confusion which surrounds gastric ulcer. In attempting to group our operated cases, we found that there were such wide variations in the conditions present that no orderly classification could be made on a purely clinical basis. In a general way, the following answered the purpose most satisfactorily:

1. Round and fissure ulcers; (*a*) acute, (*b*) chronic. They have the distinguishing feature that there is but little thickening about the base of the ulcer. Many amount to little more than a fissure, and are closely associated with group 2.

2. Mucous erosions; a condition which must be accepted with caution.

3. Chronic ulcer with a thickened base and usually irregular in form, probably an extensive variety of the chronic round ulcer.

4. Benign obstructions without regard to cause, although usually of inflammatory origin.

In our experience at the operating table, it is the last two varieties which are most frequently met with. The acute round ulcer of Cruveilhier occurs by preference in the chlorotic type of adolescent females and usually responds to medical treatment. Operation is most often called for in the acute cases by that peculiar perforation so graphically portrayed by Rokitansky, "cut out by a punch;" or by severe hæmorrhage from the stomach. Chronic round ulcer and fissure ulcer do not often lead to harmful cicatricial contraction on account of their small size. Near the pylorus they may be the starting-point for a band-like stenosis encircling the pyloric ring. Chronic round ulcer is usually found in adults, and in our experience has been more frequent in females. It would seem that there is little difference between the chronic round ulcer

and the chronic cicatricial ulcer, excepting that as the outer coats are involved the extent of ulceration increases and loses its characteristic round or oval form, while usually a healing process is apparent in some part of its extent. A subvariety of this group is the "pore-like" ulcer described by Murchison, which is met with more often in adults and gives rise to grave hæmorrhages, and yet is so minute that it is difficult to locate, even at post-mortem. The mucous "erosion," limited to a small area or several such patches, was seen in a few instances. The large "mucous erosion" described by Dieulafoy as giving rise to alarming hæmorrhages was not met with. I am unable to say just how much importance is to be attached to the surface erosion of limited extent. In the first place, the detection is difficult. The whole question of the surgical exploration for round ulcers and erosions is one surrounded with difficulty and uncertainty. There are usually no external manifestations which lead to location of the lesion, and the only way a diagnosis can be established is to open the stomach and with a short, wide speculum explore the interior. The margin of the instrument may and frequently does produce a traumatism to the superficial mucous layers, and the result is very like the pathological erosion. We have seen undoubted and typical examples covered with a membranous film of mucous character which, when brushed off, allows the nature of the trouble to become apparent. The chief obstacle to accurate diagnosis lies in the surgical indications which are to be met. Round ulcers and erosions are often multiple, and, as a rule, do not cause cicatricial contraction at the pylorus. Clinical experience has demonstrated that drainage is the best method of surgical treatment with which we are acquainted, therefore an exploration, however attractive to the surgeon, is often not completed; but the surgical indications are fulfilled by some form of gastro-intestinal operation and the diagnosis remains unproved. The surgeon hesitates to expose the patient to even a slight risk for purely diagnostic purpose. The old adage, "a good prognosis is better than a good diagnosis," leads to operations based upon symptoms. If round ulcer is found, excision is the proper

course; but there is always the chance that the ulcer excised is not the only one, and that others may exist undetected or in an inaccessible situation.

We may well ask ourselves in such cases, Does an ulcer exist? and usually we may answer yes, and base the diagnosis upon such symptoms as would establish a medical diagnosis. Clinically, these cases come to us after medical treatment has failed utterly, and either the diagnosis is unquestioned or there is secondary interference with motility, resulting in retardation or retention and gastric dilatation, giving mechanical reasons for interference. The theory of pyloric spasm is most interesting, and is a hypothesis rather than a definite condition. I have examined the pylorus in over 300 cases at the operating table with a view of establishing a normal under anæsthesia. Usually, the normal pylorus in the anæsthetized patient will allow the thumb and the forefinger to nicely meet, about the caliber of a silver dime, and under some conditions of deep anæsthesia it may be found dilated to the diameter of a silver twenty-five-cent piece. I am satisfied, however, that spasm of the whole or some part of the pyloric portion of the stomach may and often does take place, and that it is one of the causes of the retention of the excessive secretions and distress; but I am by no means sure that it is confined to the pyloric sphincter.

The so-called "chronic ulcer" of Robson has a thickened base and is frequently of large size and irregular outline, in this respect differing from the chronic round and fissure ulcer, in which there is but little new tissue deposit about the ulcer. Does the round ulcer lead to the chronic cicatricial ulcer? It is probable that the difference is merely one of degree, although the fact that the latter is much more common in males is rather against this theory.

The majority of operations were for thick-based chronic ulcer of the stomach or its late results, and these cases were very satisfactory, the irregular thickened patch of stomach or duodenal wall often locating the process with exactitude. As a rule, the ulcer was located near the lesser curvature and not infrequently at the pylorus. The posterior wall was affected

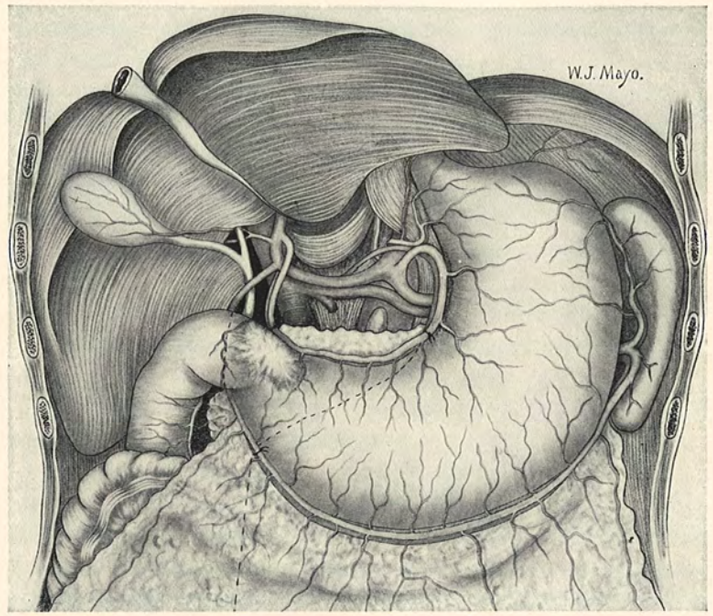

FIG. 1.—Showing line for incision in cases of ulcer of the stomach.

more often than the anterior, if only one surface was involved. On the duodenum the anterior wall was most often the seat of ulceration. The youngest patient was a girl of seventeen and the oldest a man of sixty-four. In 60 per cent. of our malignant cases, a previous history of ulcer was obtained. In two cases, malignant degeneration of the margin of a chronic gastric ulcer was demonstrated; certainly a strong argument for the excision of such ulcers when possible. We found conditions favorable for excision of ulcer in only three cases. On six occasions we either excised or turned an ulcer in by suture. in combination with pyloroplasty or gastroduodenostomy. In two of these cases, three-fourths of the pylorus was excised and closed by suture.

Lund has pointed out that "sentinel" enlarged lymph nodes in either the lesser or greater omenta may aid the surgeon in locating the ulcer. We have found this a valuable observation.

In all of the ulcers of every description which we examined, the upper two inches of the duodenum, pylorus, pyloric antrum, and that part of the stomach lying to the right of a line drawn downward from the œsophagus was the seat of disease, and in only a few instances of extensive hour-glass contraction did the ulcer extend to the left of this line. In handling the stomach during operation, limited contraction of the wall could often be noticed in the pyloric third, but not towards the cardiac end. Cannon's experiments are very interesting in this respect. He demonstrated with bismuth and the X-ray that the fundus of the stomach did not contract strongly, but that the pyloric portion, by a backward action, kept up a current in the fundus. Ulcers occur in all parts of the stomach; but in the cardiac end it is a question if they are often the cause of chronic symptoms calling for operation.

Twelve chronic dilatations without ulcer or obstruction were operated upon. In all of the cases, the stomach wall was of normal or increased thickness, indicating that an obstruction, either from a high-lying but non-stenosed pylorus, or beyond the pylorus, existed. In 1895 I reported several cases of inter-

ference with free gastric drainage by "valve formation," due to a short gastrohepatic omentum holding the pylorus high, the body of the stomach sagging sharply downward. More than half were of this description. In a few instances the medical diagnosis was extreme atonic dilatation; but even in these cases there was no great thinning of the gastric wall. We have not considered simple gastroptosis sufficient cause for operation, but in a few cases exploration revealed this condition, and in all the stomach wall was either of normal thickness or thinner than normal. In three of these cases, shortening of the gastrohepatic ligament after the method of Beyea was done.

Cancer of the stomach, 109 cases, seventeen deaths, 15.6 per cent. Late diagnosis and cachexia make the aspect of this group discouraging. Palliative operations predominate with considerable immediate mortality and no great prolongation of life. The hope of the future lies in early exploratory incision, and the necessity for this depends upon clinical observation rather than laboratory methods, which too often only become valuable when the extent of the disease is beyond cure. Given a patient of middle or later life who begins to lose flesh and appetite and suffer from indigestion without apparent cause, the possibility of cancer should be considered; and if the source of the symptoms cannot be shown within a few weeks, the situation should be explained to the patient, and the choice between exploration and procrastination allowed him. When we consider that early operation is the only hope, we may not wait on our own responsibility. The public in this way will soon become educated and cures will be more frequent. Gastrojejunostomy for malignant disease, in our hands, has had an increasing mortality, due to the fact that the better cases are selected for gastrectomy, and the late hopeless obstructions are given the meagre benefits of gastro-enterostomy, thirty-four cases, ten deaths, 30 per cent.

Is there an outlook for cancer of the stomach? We know of the prime necessity for early operation; it now remains to demonstrate how the procedure can be made more effective. In a general way, the lymphatics of the stomach lie in three groups; first, the lesser curvature and lesser omentum; second,

along the greater curvature and the gastrocolic omentum; third, in the gastrosplenic omentum. The main lymphatic channels follow the direction of the blood-vessels to the deep glands about the cœliac axis. The dome of the stomach, as pointed out by Robson, has no main lymphatic channels and few lymphatic glands. If all of the stomach excepting this portion be excised, the remaining part will be adequately nourished on the right side by cardiac branches derived from the gastric artery which joins the stomach at a point from one to one and one-half inches below the œsophagus. On the left, the vasa brevia given off from the splenic artery distal to the origin of left gastro-epiploic vessel, a distance of four and one-half to eight inches from the œsophagus, give an adequate blood-supply. These vessels anastomose with the inferior phrenic vessels. Therefore, excision of all the stomach lying below and to the right of a line drawn between the gastric artery and the left gastro-epiploic vessel is the logical operation. The advantage of this line of section is obvious. All of the main lymphatic connections are removed at the primary operation. The remaining portion of the stomach we know clinically is seldom involved unless the primary lesion is at the cardiac orifice, and the retention of the dome of the stomach enables comparatively easy intestinal anastomosis. One reason that only from 5 to 8 per cent. of gastric cancers have been cured by extirpation lies in the fact that a part of the organ has been retained in which the vascular and lymphatic connections with the diseased area have not only been close but direct. In the dome of the stomach, the lymph current is feeble through small vessels, and, most important of all, is in the other direction. Mikulicz has already called attention to the necessity of removing the whole of the lesser curvature with its gastrohepatic omentum, and has done much to elucidate the question of lymphatic infection by showing that in twenty cases of gastric cancer only one was completely free from lymphatic involvement, although, in a total of 189 glands examined, 110 were found to be without contamination. In making this radical operation we have proceeded as follows:

First, ligate the gastrohepatic omentum from the pylorus to the gastric artery, which is tied. The section is made as close to the liver as possible, and includes nearly the whole of the lesser omentum. This mobilizes the pyloric end of the stomach, which is drawn down and out. Second, with the fingers in the lesser cavity of the peritoneum, the gastrocolic omentum is ligated at a safe distance. The duodenum, on the one side, and the pylorus, on the other, are doubly clamped and divided between with the cautery knife. A purse-string suture of silk is placed around the duodenum three-fourths of an inch below the divided end, and, after suturing with catgut through the cauterized area, the stump is inverted and the purse-string suture drawn tight. This disposed of the duodenum permanently. Third, ligation of the gastrocolic omentum to a point near the origin of the left gastro-epiploic artery, which is tied. Fourth, a groove is made by heavy pressure forceps, separating the dome from the balance of the stomach and with catgut on two needles, a shoemaker stitch in the pressure furrow renders section with the actual cautery bloodless and avoids opening the portion of the stomach to be retained. This line of suture is turned in by a continuous silk Cushing suture supported occasionally by an independent Halsted stitch of the same material. In this step of the operation we sometimes use the Kocher clamp and suture each layer separately. Fifth, gastrojejunostomy between the gastric pouch, which is just about large enough for the purpose, and the jejunum. Sixth, entero-anastomosis between the two limbs of jejunum, short circuiting the biliary and pancreatic secretions as nearly as possible at the same level as the origin of the jejunum. It took two deaths to teach us the value of this manœuvre. The deaths were not from regurgitant vomiting; but when the anastomosis was affected in some cases, the intestine was sharply bent at the site of union, being drawn upward and to the left in such a manner as to leave from fourteen to sixteen inches of jejunum hanging upon the anastomosed area, a situation in which peristalsis does not materially aid in onward flow of the biliary and pancreatic secre-

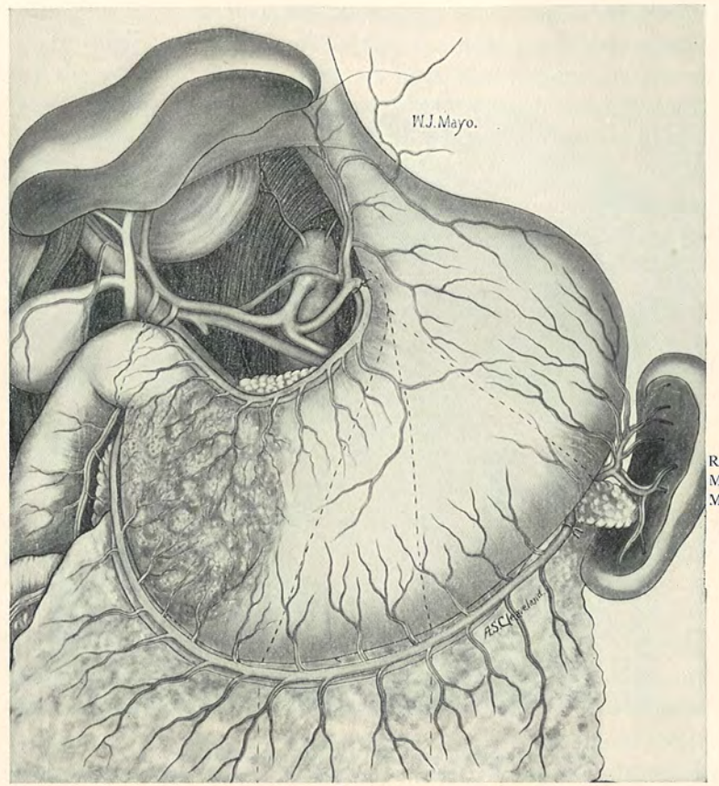

FIG. 2.—Lines of incision practised by different surgeons in the removal of cancer of the stomach.

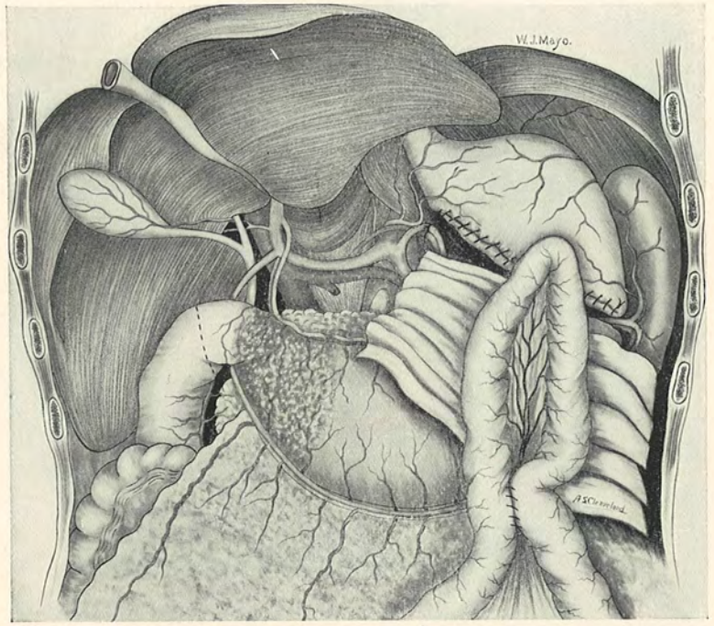

FIG. 3.—The completed operation for cancer of the stomach.

tions. The proximal loop becomes distended with these juices to the level of the anastomosis, giving a traction weight of a column of fluid the diameter of the distended intestine. In one patient on the fifth and in one on the ninth day union suddenly gave way entirely, or in part, in patients apparently doing well. This does not happen in every case,—two out of eight only; but in at least half of the cases the bad mechanics of the situation was evident on inspection. Seventh, the remains of the gastrocolic omentum are attached to the posterior wall and the abdomen closed. This operation should give all the benefits of complete gastrectomy in pyloric cancer. (I find that Mr. Moynihan, of Leeds, has recommended and practised a similar procedure, but his work was buried in the Clinical Society of London, which does not permit of journal publication. I did not know of it until he informed me personally during his visit in May, 1903.)

In view of the splendid work of Hartman and Cuneo, it is a question whether the operation outlined should be the routine one, or for exceptional cases only. That the whole of the lesser curvature with the glands in the corresponding portion of the lesser omentum should be removed is the conclusion of all of large experience; but the advantage of removing the major part of the greater curvature is open to debate. Cuneo demonstrated that the lymph current along the greater curvature was from the left to the right, and that in pyloric cancer not only is there comparatively little tendency to lymphatic involvement in this region, but that it is confined to the glands in the immediate vicinity of the growth, and does not extend to the left of the pyloric portion. Hartman therefore bases his line of section upon this fact, and removes all of the lesser curvature and saves as much as possible of the greater curvature. We have several times made an operation very similar to that described by Hartman, as it is certainly much easier than the one which we have outlined, and, as the mechanics of the anastomosis is better, entero-anastomosis is unnecessary. Occasionally, however, growths or glands are found to the left along the greater curvature. It may be said that such cases are inoper-

able, yet we have had two such patients live beyond a year. In the eight cases operated upon by the radical method given above, there were three deaths, while there were but two deaths in the eighteen remaining cases operated by various methods from simple pylorectomy to the operation of Hartman. The former group comprises only a small number of the worst cases, and some of the deaths were avoidable by a better technique. Be this as it may, some form of radical extirpation has been the only reasonably satisfactory operation we have performed for cancer of the stomach, twenty-seven cases, five deaths, 18.5 per cent. (Since completing this paper, one case died after five weeks from abscess of the lung, making six deaths, 22.5 per cent.) One patient lived three years and seven months before recurrence. Several are alive and well over two years, and the general average has been over a year. It is surprising how few of those recovering from the operation have failed to live a year or more.

It may not be out of place to briefly discuss the merits of the three chief methods of improving stomach drainage, namely, pyloroplasty, gastro-enterostomy, and gastroduodenostomy.

Nineteen cases were subjected to the pyloroplasty of Heinicke-Mikulicz; six of these came to secondary gastrojejunostomy through failure of the operation to adequately drain the stomach. The remaining cases are well. There were no deaths. The opening can be made of sufficient size, but the increase in caliber is not in the line of gravity drainage, or, at least, the enlargement of the opening is as much above the pylorus as below it, and the greatly dilated stomach with its overstretched and degenerated musculature is unable to elevate the food, and the stagnation is not entirely relieved. Again, in the six reoperated cases, the pylorus was found adherent at a high level, due to the abstinence of food and other causes of downward traction during the healing process. In three cases we fastened the pylorus, after plastic operation, to the neighborhood of the umbilicus by suture, to secure a low point. These patients have remained well; but as we were also careful to

choose only moderate dilatations, the value of the manœuvre is uncertain, and there are objections to the plan.

Gastro-enterostomy was done 168 times, divided as follows: Gastrojejunostomy, 121; gastroduodenostomy after Finney, twenty-six; independent gastrojejunostomies in connection with pylorectomy and gastrectomy, twenty-two. Of the 121 cases of gastrojejunostomy made purely for drainage purposes, there were seventeen deaths. The percentage of mortality in the benign cases was 8 per cent., in the malignant, 30 per cent.; the great mortality of the latter being due to the choice of favorable cases for radical operation, the hopelessly advanced and cachectic coming to gastro-enterostomy, and, could the condition have been known beforehand, an operation would not have been undertaken in some of these cases.

Gastrojejunostomy for benign obstruction at the pylorus is one of the most satisfactory operations with which we are acquainted. It rapidly drains from the lowest point, and if the obstruction at the pylorus is permanent, the new opening does not contract materially. Again, if the opening be made at the bottom of the stomach-pouch at or near the greater curvature, regurgitant vomiting will not take place and entero-anastomosis is unnecessary, providing either the Murphy button or Robson bone bobbin be used to mechanically maintain an opening during the early critical period. We can only speak from these two methods, as we have had no experience with any other plans. In some instances a feeling of distention or vomiting after operation may take place, and, under such circumstances, we promptly direct gentle stomach lavage. We now use the posterior suture operation over the bone bobbin for benign obstructions and the Murphy button for malignant disease, and in the latter instance the anterior method. However, as between the suture and the Murphy button and the anterior and posterior operation we have been unable to see any marked difference in results beyond the occasional retention of the button in the stomach, which seems to be of no practical importance.

During the recent visit of Professor Mikulicz to this country (May, 1903), he had the kindness to do a posterior

gastro-enterostomy in our clinic by a method which I believe is greatly superior to the one we had been in the habit of doing. It avoids the possibility of angulation, as it does not form a loop with its attendant dangers. The operation as performed depends on two simple principles. First, the origin of the jejunum lies above the greater curvature of the stomach. After opening the transverse mesocolon and fastening it to the posterior wall of the stomach, the upper three or four inches of the jejunum lie directly in contact with the gastric wall, hanging perpendicularly with its free border (opposite the mesentery) facing the stomach wall. Second, by making a transverse incision in the jejunum three or four inches from its origin and an incision close to the greater curvature of the stomach, a suture anastomosis is made in which the stomach is drained at the lowest point without the possibility of kinking the intestine. The whole trouble has been that in making a longitudinal incision in the intestine it was necessary to form the misfortune-breeding loop. The scheme of the operation is much the same as used by Czerny. The good mechanics of the procedure has been especially dwelt upon by Peterson of the Heidelberg Clinic.

Gastrojejunostomy, if the pylorus be unobstructed, is far from satisfactory. In a paper read before the American Surgical Association, June, 1902, I reported four cases in which contraction at the site of the anastomosis took place, and we have reoperated upon four similar cases since that time. In six of these cases we did a secondary entero-anastomosis between the limbs of the loop. Four times the entero-anastomosis was effected with the Murphy button, and two of these patients died from sudden separation of the anastomosed area at the end of the first week. This did not take place in two suture operations. In all of these cases the proximal limb of jejunum from the point of anastomosis to its origin looked enlarged and thickened, a condition that might be called water-logged and in marked contrast to the bowel immediately distal to the anastomosis. In this condition of the afferent loop lay the reason for the failure of the plastic union after the button,

and merely illustrates the well-known danger of setting up pressure necrosis in damaged tissues. Primary entero-anastomosis with the button is safe, but not so secondary operations. If the obstruction at the pylorus is complete, this condition of the jejunum above the gastro-intestinal anastomosis has not been found. A large number of cases of benign affections of the stomach without pyloric stenosis require operation. This is particularly true in ulcer, and relapse after this operation has been frequent. Our observations would seem to show the following course of events. After the operation there is at least temporary healing of the ulcer. The pylorus begins to functionate normally and the unnecessary gastro-intestinal fistula contracts. There is renewed irritation from retained secretions, followed by reopening of the ulcer, return of pyloric spasm, and failure of the operation to effect a permanent cure. In some cases the double stomach drainage seems to give rise to unpleasant symptoms without contraction of the fistula. In twenty-eight cases of gastrojejunostomy with open pylorus, eight came to secondary operation from contraction of the gastro-intestinal opening, while in all cases with permanent obstruction at the pylorus there were no cases of secondary operation from this cause. This has also been the experience of Ochsner, who also points out the fact that if relapse takes place, symptoms will arise within four months. To obviate this sequela, in one case, at the primary operation, we divided the pylorus and closed both the gastric and duodenal ends by suture, thus creating the favorable condition of complete obstruction. Once we sutured the pylorus high up under the liver, causing valve formation, as first suggested by Cordier. Once we placed a circular purse-string suture about the pylorus, closing sufficiently tight to obstruct the opening. This idea was adopted from Dawbarn. I may say that all of the methods proved satisfactory; but there was the grave objection of too much operating for a benign condition, and it introduced unnecessary elements of danger. In June, 1902, Dr. Finney introduced his method of so-called pyloroplasty, but which is in reality a gastroduodenostomy. The opening is

downward in the line of gravity, and in most of the suitable cases for this operation the gastric dilatation is not extreme. In two cases of rather extensive dilatation and pouching we combined with it shortening of the gastrohepatic ligament as described by Beyea. The operation of Finney is especially adapted to those cases in which there is little disease about the pylorus. It enables careful examination of the pyloric end of the stomach, and excision of a neighboring ulcer can be easily combined with it. We had two such cases. It is less suitable if there be extensive involvement of the pylorus; but it is in just this class of cases that gastrojejunostomy is at its best. The question to be settled by further experience is, whether the operation of Finney will as rapidly cure active ulcer of the stomach as gastrojejunostomy. In the latter operation the drainage is from the cardiac end to the left of the muscular pyloric portion; while, even if the pylorus be made of ample size by the Finney procedure, the food and secretions must pass the ulcer site before it leaves the stomach, and we know that obstruction is not all necessary to the formation of ulcer, as they exist beyond the pylorus in the duodenum. In twenty-six cases operated upon by the method of Finney, we had one death, and that from avoidable cause. Were it not for the mortality, resection of the muscular pyloric portion of the stomach would be indicated in gastric ulcer, as in this way the ulcer-bearing area would be permanently disposed of and an absolute cure insured. This was first suggested by Rodman, and I believe with him that this will be the operation of the near future.

A TABLE OF 313 OPERATIONS UPON THE STOMACH AND FIRST PORTION OF THE DUODENUM.

STOMACH.

Benign.	Total.	Recovered.	Died.
Gastrojejunostomy	89	82	7
Gastroduodenostomy	28	27	1
Pyloroplasty	19	19	..
Gastrostomy	4	4	..
Gastrotomy	5	5	..
Excision of ulcer	3	3	..
Perforating ulcer	2	1	1

Benign.	Total	Recovered	Died.
Gunshot	1	1	..
Gastrorrhaphy	1	1	..
Gastroplication	1	1	..
Hour-glass stomach	3	2	1
Adhesions	8	8	..
Shortening of gastrohepatic ligament (Beyea)	6	..	..
Subdiaphragmatic abscess from gastric ulcer	2	1	1
Fistula of stomach and gall-bladder	1	1	..
	173	156	11

Cancer.	Total.	Recovered.	Died.
Gastrectomy and pylorectomy	27	22	6
Gastro-enterostomy	34	24	10
Gastrostomy	13	11	2
Exploratory	38	38	..
	112	95	18

First Portion of Duodenum.	Total.	Recovered.	Died.
Excision of ulcer	3	2	1
Perforating, acute	1	1	..
Perforating, chronic	2	2	..
Chronic ulcer	6	5	1
Ulcer of both duodenum and stomach	5	5	..
Anastomosis between the first and second portion of duodenum for ulcer	1	1	..
Adhesions, result of periduodenitis	4	4	..
Adhesions, result of inflammation of accessory lobe of pancreas	1	1	..
Fistula between gall-bladder and duodenum requiring suture	5	5	.
	28	26	2

DISCUSSION.

Professor von Mikulicz, of Breslau, said that the question discussed by Dr. Mayo as to which is the best operation for establishing a new communication between stomach and small intestine is of the greatest importance, but he did not consider this question to have been finally decided. There is no doubt but that operation is the best one which most completely restores the physiological relations. From this stand-point the operation of pyloroplasty stands at the head. Next in importance is the operation of gastroduodenostomy. If one of these two operations for technical reasons should not be feasible, one then has to consider the

operation of posterior gastrojejunostomy according to Von Hacker, which, if correctly performed, yields excellent results. Least to be recommended is the operation of anterior gastro-enterostomy. He would no longer perform this latter operation in benign affections of the stomach, on account of the most recent experiences which have shown that a peptic ulcer of the jejunum occurs after such operations with relative frequency. He considered this operation permissible only in gastric carcinoma in which the normal acidity of the gastric juice is absent.

As to Finney's operation, he considered it a very practical technical modification of pyloroplasty, but in the main one accomplishes precisely the same with the original operation of pyloroplasty, providing this operation is only properly executed. As to the Murphy button, in benign affections of the stomach, he did not employ it. In operations for gastric carcinoma, however, he employed it very frequently, as also in gastro-enterostomy and in resection. In the latter operation he considered the Murphy button indispensable, whether he operated according to the first or second method of Billroth. The technique is simpler, quicker, and much safer. When it is possible, he employed the first method of Billroth, which is the joining of the stump of the stomach with the duodenum, because this method again restores completely the physiological relations. Only in cases where this method cannot be performed, on account of either shortness or immobility on the part of the duodenum, did he employ the second method of Billroth, namely, the joining of the stump of the stomach with the jejunum. Regarding the relation between the number of benign and malignant diseases of the stomach, it had impressed him that in America the former, especially gastric ulcer, was the more numerous class, while carcinoma of the stomach occurred relatively less frequently. In Germany this proportion is reversed: at least he as a surgeon saw four times as many gastric carcinomata as gastric ulcers with their complications. Perhaps the frequency of gastric ulcer in America may be associated with what in our estimation is the not very natural nourishment which the American ingests, namely, ice-cold drinks and highly seasoned foods.

As far as the indications for operative procedure in gastric ulcer are concerned, it must not be forgotten that in this disease medical treatment is able to contribute much benefit. Furthermore, the surgical experience in this direction is still far too meagre to enable one to positively contend that in the operative procedure there is an infallible remedy for gastric ulcer itself. The whole question is by no means as yet decided, and therefore German surgeons are very reserved in considering the indications that are present in simple gastric ulcer.

Other cases, of course, are to be considered according to the complications which offer clear indications for operation, as, for instance, stenosis of the pylorus and hour-glass stomach.

In acute hæmorrhage they refrain, as a rule, from looking for the bleeding ulcer, as this is generaly a too difficult and unsafe a procedure. They do, however, perform gastro-enterostomy and at the same time a jejunostomy, as by means of the latter the patient may be exclusively nourished for weeks, and only in this manner the functional activity of the stomach is eliminated. As far as the localization of gastric carcinoma is concerned, his experiences did not coincide entirely with those of Mayo. If the results of post-mortem examinations are compiled, it will be found that certainly in the majority of cases the pylorus is included in the carcinomatous process. If, however, the results of the operations are considered, that is in the earlier stages of carcinoma, it will be found that the lesser curvature is most frequently affected by the carcinoma, which then attacks the pylorus secondarily. According to his experience, carcinoma of the stomach is situated in about 40 per cent. of cases primarily in the lesser curvature, and only in 20 per cent. of cases primarily in the pylorus. As far as the technique of the radical operation for gastric carcinoma is concerned, he referred to his numerous publications on this subject. For the last eight years, as a matter of principle, he had not only extirpated all the lymphatic glands at the greater curvature, but also the whole omentum with the lymphatic glands and lymph channels as far as the cardia. The technique is accurately published in the text-book of practical surgery by Von Bergmann, Von Bruns, and Von Mikulicz. The permanent results following resection of gastric carcinoma are in the main quite encouraging. His statistics show that 16 per cent. of those operated upon remain free from recurrences for over three years. But also in those cases which are not radically cured, resection of the stomach yields more than gastro-enterostomy. Some of the cases do not have any local

recurrence, but after a longer period has elapsed metastases develop, living from one and one-half to two and one-half years without gastric disturbances. He therefore preferred resection of the stomach to gastro-enterostomy, even if there are no positive prospects present for a radical cure of the carcinoma.

MR. B. G. A. MOYNIHAN, Leeds, England, said that he thought the operation of pyloroplasty might be practically discarded. He had only done the operation three times. In the first the patient made a good recovery, and was one of the most satisfactory stomach patients that he had ever operated upon. Of the remaining two cases, one was partially improved; in the other a gastro-enterostomy was performed four or five months after the original operation. He felt very decided that the operation of pyloroplasty was by no means so satisfactory in any single particular as the operation of gastro-enterostomy. For simple diseases of the stomach he had operated up to the time of his leaving England upon about seventy-five cases with only one death.

He had used the Murphy button, but in the last sixty-five operations that he had done he had not used it. The button had, however, been a very important step in perfecting his operation of gastro-enterostomy. It had taught him to remove the mucous membrane, which is so necessary in order to secure perfect anastomosis with an opening patent from the first.

Dr. Mayo had laid down the laws for the treatment of malignant disease of the stomach on almost the same lines as he had emphasized some two years ago in a paper read before the Clinical Society of London. The extension of malignant disease occurs principally through the lymphatic system. He described three areas,—one along the greater curvature, one along the lesser curvature, and one at the fundus, an area which he had described as an "isolated area." In the beginning he removed the whole of the lesser curvature, and the whole of the greater curvature up to the level of the hilum of the spleen. This leaves the "isolated area" of the stomach, and the only disadvantage that it has is that the pathology is not perfect, because the lymphatics of this area are in association with the lymphatics of the lower end of the œsophagus. In reference to the question of duodenal ulcer, as the cases had come to him, he thought it is very seldom primary. He did not remember ever seeing duodenal ulcer without a gastric ulcer. It is known that gastric ulcer is frequently associated at some period with hyperchlorhydria. There result first the gastric ulcer, and then a peptic ulcer in the first portion of the duodenal wall. He had seen cases similar to those which Dr. Mayo had described in which there was gastric ulcer, and a gastro-enterostomy was done, and peptic ulcer was formed in the outside loop of the jejunum. Gastric ulcer is frequently multiple. In a very considerable number of cases, roughly speaking, gastric ulcer is not a solitary condition; there are more ulcers than one in the majority of cases. Therefore excision of gastric ulcer is very rarely necessary. He had excised the ulcer for hæmorrhage in one case only, and that case died. This was the only case which he had lost. In the other cases he had performed the operation of gastro-enterostomy without bothering much about the ulcers.

DR. ALBERT VANDERVEER, of Albany, said that although in past years he had felt that ulcers of the stomach could be largely benefited and brought to recovery by a medical line of treatment, and he had presented a number of cases in an article on the subject some years since, yet he realized the very impressive lesson brought out by Dr. Mayo in his large number of cases, the great majority being chronic ulcers, which gave a very positive evidence of the tendency of the cicatricial areas to later present malignant degeneration. He endorsed all that Mayo had said upon this subject, and could not agree with some of our writers at the present day that ulcer of the stomach is not a surgical lesion.

In regard to the surgical treatment of cancer of the stomach, he quite agreed with Dr. Mayo that laboratory methods of investigation are not yet as clearly developed and positive in their conclusions as could be wished, so far as rendering aid in doing an early operation. Medical men who are making this subject a specialty, as regards investigation of the contents of the stomach, as to the presence or absence of hydrochloric acid, the presence of lactic acid, the Boas bacillus, etc., are apt to procrastinate, and not infrequently the patient's chances are seriously interfered with by waiting too long before advising operation.

There is much truth in the remark that when once a tumor is felt, cancer of the stomach has become a very serious complication.

He quite agreed with Dr. Mayo that a clinical diagnosis can

generally be made sufficiently correct to make it quite proper to advise a prompt operation. When once the abdominal cavity has been opened, and one is able to investigate the stomach carefully, then the extent of the glandular involvement should control largely as to a resection. He was quite positive that unless one made a complete removal of the infiltrated glands, and in doing a resection got well beyond the diseased portion of the stomach, or in doing a gastrectomy did it completely, some of the palliative operations were very much more desirable, and of greater service to the patient.

From a personal experience with quite a large number of cases of gastric cancer he had seen great good result from a simple gastro-enterostomy or gastrostomy.

In pyloric stenosis, without many adhesions to the surrounding portions, and when it is plainly apparent that the lesion is non-malignant, he endorsed most earnestly Dr. Mayo's statement in regard to pyloroplasty.

Gastrojejunostomy had been with him a gratifying operation. It is certainly very pleasing to see the relief these patients obtain from this procedure from the perfect gastric drainage that is afforded.

Gastroduodenostomy had been with him a very difficult operation, and one that he had not done very frequently.

Dr. J. M. T. Finney, of Baltimore, remarked, as to the treatment of pyloric stenosis of benign origin, that the solution of this problem could be expressed in one word, "Drainage," and this must be both permanent and effective. Any method, it seemed to him, that fulfilled these two requirements would be satisfactory; but it remains to be proven which is the best method.

At the present time, the advocates of gastro-enterostomy are certainly in the majority, both in numbers and professional eminence; but some of the other methods are or have been advocated by men whose opinions are worthy of consideration.

He had seen many cases of pyloric stenosis from one cause or another which had been much benefited by medical treatment, and a few in which the up-to-date physician had been able to avoid a surgical operation. He believed that if we were more careful in our methods of examination, if we studied our cases a little more closely for longer periods of time, and if we called

in the aid of the physician more often, we would accomplish results, not as speedily perhaps, but in a way fully as satisfactory to the patient as if we rushed hastily into a surgical operation.

Early operation, certainly in the majority of cases, has many points to commend it; but in doubtful cases the surgeon should call to his aid the physician, and that speedily, and so should the physician call upon the surgeon, not perhaps with the idea of immediate operation, but in order that the case may be more intelligently and satisfactorily considered. He was an advocate of early operation in proper cases, but he could not subscribe to all that had been said in this respect. He believed, also, that cocaine was a valuable agent in cases where, for any reason, the general anæsthetic is contraindicated in making an exploratory incision. He had used it frequently with the greatest satisfaction and had never seen any untoward results. The mortality in all operations upon the stomach is growing steadily less until now the mortality rate is extremely low.

As to operation for the relief of benign stenosis of the pylorus, the operation of pyloroplasty, after the Heineke-Mikulicz method, has not given general satisfaction, although in the hands of Von Mikulicz it had been productive of excellent results; but, as Dr. Mayo suggested in his paper, in the way in which it has been performed in this country, at any rate, it has been followed by a considerable number of recurrences.

The operation of pylorectomy must of necessity always be attended with a relatively high mortality, and for this reason it is only to be recommended in cancer. Dr. Finney had during the last two years performed pylorectomy eight times. He had followed practically the method of Hartman. Six of these cases made good recoveries from the operation and lived varying lengths of time; two or three are still living. It would seem, however, that so far as cure is concerned, from the nature and extent of the tissues affected and the lymphatic involvement which necessarily follows, that it is, and very likely always will be, next to impossible to eradicate entirely the cancerous growth, and that we must always look forward to a recurrence of the trouble, either locally or elsewhere. For this reason, the operation which offers the greatest amount of temporary relief at the least possible risk is the operation of choice.

In regard to gastro-enterostomy, he hesitated to say any-

thing against it, because so much had been said in its favor by those whose opinion and experience were both greater and more weighty than his, but, unfortunately, the results of all surgeons, he was sure, were not the same as those they had listened to. Most surgeons had met all too frequently with unfortunate results after the employment of this operation They are constantly meeting with cases which may have done well perhaps from the immediate operation, but which have later vomited themselves to death or have given other obstructive symptoms. Many efforts have been made to overcome the objections which have been urged, and which have made themselves evident after this operation, and the satisfactory results reported by some of the previous speakers bore witness to the efficacy of their efforts, but the majority of operators had not had the same satisfaction.

Some of the objections that have been urged are inherent in the operation, and cannot be overcome as long as the operation is performed in the manner in which it is at present. Some of these objections may be more theoretical than practical, but it would seem that the normal position of the pylorus was the proper one, and any operation which preserves the normal relations is better than one which disturbs them.

Of course, the final test of an operation is what it does so far as the patient's health and comfort are concerned. Scientific observation of the work done by the stomach will throw a great light upon the relative value of the different methods.

Dr. Friedenwald, of Baltimore, had kindly made repeated chemical examinations of the stomach contents in five of his cases of pyloroplasty, in all of which it was found that, from very abnormal conditions before the operation, the patients had all returned to a practically normal condition in a comparatively short time after the operation.

With regard to the operation of pyloroplasty as suggested by himself at the Meeting of the American Surgical Association in Albany in 1902, and which it is unnecessary to describe again, this operation has this advantage over all operations in that it both makes the point of drainage at the lowest or approximately lowest point in the stomach and yet still preserves the normal relation. At the same time it is easy of accomplishment. It offers immediate relief to the patient in that the drainage is accomplished at once, and the outlet is so large as to make it very

free. The after troubles are surprisingly little, and adhesions are no bar to the performance of the operation. It can be carried out in the presence of still active ulceration. He recently excised an ulcer on the posterior portion of the pylorus with very satisfactory result. It remains to be seen by a more extended use of the operation whether or not it is really the best at our disposal for the relief of benign stenosis of the pylorus. Of the thirty-eight cases which he had been able to collect, the mortality had been seven and one-eighth per cent.

ON THE RESULTS OBTAINABLE BY OPERATIVE MEASURES IN AFFECTIONS OF THE STOMACH.

BY JOHN B. MURPHY, M.D.,
OF CHICAGO.

ON the basis of the frequency with which surgical diseases of the stomach are brought to the surgeon's notice, we may divide them into:

(*a*) Gastric Carcinoma; (*b*) Gastric Ulcer; (*c*) Pyloric Obstruction; (*d*) Pyloric Retention; (*e*) Gastroduodenal or Pyloroduodenal Lesions.

If surgery is to accomplish for the stomach all that it is capable of, the frequency with which the surgeon deals with the stomach must be for lesions in substantially the reverse order, except in the class of gastroduodenal diseases, *i.e.*, to obtain the greatest results from a prophylactic as well as therapeutic stand-point. The order of frequency with which the surgeon should be consulted must be:

(1) Pyloric Retention; (2) Pyloric Obstruction; (3) Gastric Ulcer; (4) Gastric Carcinoma; (5) Gastroduodenal Lesion.

If the first three of this second classification be timely and properly treated from a surgical stand-point, the surgeon will be consulted very much less frequently for carcinoma of the stomach. Thirty-five per cent. to 45 per cent. of all carcinomata occur in the stomach; from 1 per cent. to 3½ per cent. of all deaths are caused by this disease, varying in the hospitals in different countries,—in English hospitals, in 8468 necropsies, 1 per cent., Brinton; in Vienna, in 61,287 necropsies, 1½ per cent., Gussenbauer; in Prague, in 11,175 necropsies, 3½ per cent., Welch.

The possibilities of surgery in carcinoma will not be materially increased by any improvements in technique over the

magnificent showing of Dr. Mayo's results in 109 cases with 15.5 per cent. mortality.

The improvement in the surgery of carcinoma of the stomach must come from:

(*a*) The prophylaxis in the recognition and removal of conditions which tend to the production of carcinoma;

(*b*) Pronounced improvement in our diagnosis of the early stage of the disease;

(*c*) Early radical removal.

Before the prophylaxis can be effected, the clinician must answer a few questions. First, Are there precancerous pathologic conditions recognizable by a symptom complex? Second, What are the pathologic conditions and the symptoms? Third, How are they to be treated?

The first may be answered. They are recognized, and, as illustrated beyond controversy, may be mentioned the gastric ulcer and pyloric retentions with their sequences, cicatrices, and gastrectases;

Second, the pathologic conditions and symptoms. If we mentally review the cases of carcinoma that have presented themselves, we find that the manifestations of carcinomata have not appeared, unless in the rarest possible circumstance, as a thunder-bolt from a clear sky, but have implanted themselves on a train of gastric symptoms that have existed for months and even years. It is only fair to assume that these gastric irritations and retentions have played a prominent pathologic rôle in the production of carcinomata of the stomach, the same as the mild irritation of the pipe on the lip, the gall-stone in the gall-bladder, the impacted fæces in the colon. I refrain from speaking of the treatment of the pathologic factors here, as we will insist later that these pathologic conditions from the suffering and incapacity which they entail demand radical surgical treatment in themselves, and are up to this hour grossly neglected both by the surgeon and the physician, with few exceptions, like in the Mayo, Mikulicz, Czerny, Mayo Robson, and Moynihan clinics.

Improvement in the medical diagnosis has been immate-

rial, as far as positive knowledge is concerned, in the last decade, and does not promise much for the immediate future. We have stated that carcinoma of the stomach in a large percentage of the cases is preceded by other pathologic conditions, be it ulcer, pyloric obstruction, pyloric retention with their sequences, pyloric irritation, gastrectasis, and secondary ulceration. The questions to be answered now are, " Do we recognize the transition from these precancerous conditions to the cancerous?" No. " Can we?" Yes. First, How soon after the penetration of the basement membrane by these erratic epithelial cells are symptoms manifest, and what are the symptoms? Second, How soon after the penetration of the basement membrane by these erratic epithelial cells are the cells transmitted (*a*) through the lymph spaces to adjacent areas in stomach walls, (*b*) through lymphatic drains to neighboring lymph-nodes, (*c*) through the lymphatics to the first filter gland, (*d*) from the primary filter gland to second and subsequent filter glands, (*e*) from the last filter gland to the chyle duct? How do they pass through the pulmonary capillaries? Where and how do they produce elective metastases?

Until these questions are answered, there will be little improvement in our results from a surgical stand-point with carcinoma ventriculi, as the technique of gastrectomy has well-nigh attained the ideal, as illustrated in its application to a large number of cases with magnificent results reported by Mayo and Van der Veer.

The solution of these pathologic questions herein submitted cannot come from post-mortem examinations, except in cases of accidental death occurring in the early stage of gastric carcinoma. They must be determined on the surgical table (*a*) in operations for the pathologic conditions which lead to carcinoma and (*b*) in explorations for suspected carcinoma by celiotomy and gastrotomy.

The results of the mechanical surgical treatment of pyloric obstructions and retentions are gratifying, first, as to the relief afforded the patients, and, second, as to their freedom from danger. The former is well recognized; the latter, the freedom from danger, is represented in Mayo Robson's results (reported to me in a personal communication, February 9, 1903) in 101 cases of posterior gastro-enterostomy with 3.9 per cent. mortality, and twenty cases of pyloroplasty without a single mortality. A study of the mortality shows that the deaths were due primarily to the extremely low condition of the patient at the time of operation. With these facts in view, it is fair to presume that the physician will call on the surgeon more frequently for exploratory laparotomy for diagnostic purposes; furthermore, that the surgeon will not only perform exploratory laparotomy for the diagnosis of gastric lesions, but that he will do as a routine the rational operation, which is the large longitudinal gastrotomy, and make an inspection of the gastric mucosa, which is so necessary for the recognition of the early carcinomatous changes. That this operation is practically without danger will be accepted from the great number of more difficult operations which have been performed with their *nil* mortality from the operation *per se*. Exploratory gastrotomy, therefore, will be the ideal procedure for the early diagnosis of suspected gastric carcinoma. By this procedure many lives will be saved, much suffering avoided, and the operation for gastric carcinoma will give entirely different results in their immediate mortality, and the permanency of the cure. The time and frequency of transmission of carcinoma from the original focus of invasion to the neighboring lymphatics and glands depend upon the portion of the stomach primarily attacked. They are at a minimum in the greater curvature and reach the maximum in the lesser curvature and pyloric area. This is in direct ratio to the richness of the lymphatic supply, and is analogous to the same pathologic predisposition in the gall-bladder, uterus, and urinary bladder. Unfortunately for the patients, however, the areas of least likelihood of transmission are also the areas of least primary invasion. Fortunately for the surgeon, the area most frequently attacked by carcinoma is the one most easily exposed for ocular examination in exploratory gastrotomy.

Do the results of operations for carcinoma ventriculi so far obtained justify us in hoping for much better results in the future? Yes; on the following basis, supported by the statistics herewith submitted. First, There is a small percentage of unquestioned permanent cures already secured, notwithstanding delayed or tardy diagnoses. Second, Life has been materially prolonged in the cases in which the operation was not performed *in extremis*. Third, The suffering of those who survived the operations of radical removal was materially less, as death was caused by the metastatic growths rather than by the recurrence of the disease *in loco*. Fourth, The price in mortality is not too great for the profit in longevity and freedom from suffering. Fifth, The future will give more fruitful results, with ever increasing early recognition of the disease and our greatly improved technique. That the number of permanent cures will increase may be estimated from the accessibility of the primary location of the disease, as shown in 1300 cases reported in Mikulicz's article. It was in the pylorus, 791 times, 60.8 per cent.; lesser curvature, 148, 11.4 per cent.; cardia, 104, 8 per cent.; posterior wall, 68, 4.7 per cent.; very late cases (whole or part of stomach), 61, 4.6 per cent. Multiple tumors occurred with pylorus as primary focus in forty-five cases, 3.5 per cent.

With greater curvature, thirty-four cases, 2.6 per cent.; anterior wall, thirty cases, 2.3 per cent.; fundus, nineteen cases, 1.5 per cent.

Illustrating the frequency of location reported by individual operators, we quote the following:

Location in pylorus, 60 per cent.; fundus, 30 per cent.; cardia, 10 per cent. (Gussenbauer).

Location in pylorus, 54 per cent.; lesser curve, 16 per cent.; cardia, 9 per cent.; anterior wall, 3 per cent.; posterior wall, 4 per cent.; both walls, 4 per cent.; greater curve, 4 per cent.; diffuse, 6 per cent. (Lebert).

Location in 1796 cases: pylorus, 1110; lesser curve, 197; cardia, 158; rest of stomach, 331 (Furnivall).

Age. Seventy-five per cent. between forty and seventy years (Welch).

Age. Any period of adult life; most common forty to sixty years (Mayo Robson, 1903).

Sex. Thirty-six males to twenty-three females.

Metastases. In 59 per cent. (Gussenbauer and Winiwarter).

The frequency of prominent symptoms: In 86.6 per cent. of cases pain is present; in 85.3 per cent. of cases vomiting is present; in 76.6 per cent. of cases tumor is present (Robson, 1903).

Mikulicz, in writing on cancer of stomach, states: Results are unsatisfactory because (1) patients do not seek advice soon enough, but (2) mainly because a sufficiently radical operation is not done. To be radical, the resection must extend up the duodenum five to ten millimetres.

In papillary cancer with a large base, the prognosis is relatively good, as it is least malignant. Since the radical operation takes some time, Schleich's anæsthesia is recommended, which even debilitated patients can stand.

Mikulicz claims that in most cases anastomosis between the duodenum and the stump of the stomach is impossible. Hence he generally closes the duodenum by a purse-string suture and establishes an anastomosis between the inferior angle of the gastric wound and the jejunum. This is simpler, takes less time, and is more rational, since it changes the position of the stomach the least.

Indications for operations in gastric cancer, as given by Mayo Robson (April 25, 1903, *British Medical Journal*):

(1) In irremovable growth at the cardiac end, if it involve the cardiac end and adjacent portion, gastrostomy should be performed in order that starvation may be staved off.

(2) Where the disease involves a great part or the whole of the stomach, is irremovable, and gastro-enterostomy impracticable, and in which any attempt at taking food brings on pain and vomiting, so that the patient must rapidly die in great distress, here a jejunostomy should be performed, and through a Jaques catheter sufficient food can be given to ward off starvation, and relieve the pain caused by attempts at taking

food by the mouth. The operation can be done through the small exploratory incision, and need involve very little longer time.

(3) If the disease produces pyloric obstruction, but where, on account of extreme feebleness, or because of extensive adhesions, secondary growths of involvement of glands, it is considered unwise to attempt pylorectomy or partial gastrectomy, a gastro-enterostomy may be performed.

He concluded as follows: 1. How desirable it is to make an early diagnosis of cancer of the stomach in order that a radical operation may be performed at the earliest possible moment.

2. That it may be needful to perform an exploratory operation in order to complete or confirm the diagnosis.

3. That such exploration may be done with little or no risk in the early stages of the disease.

4. That even where the disease is more advanced and a tumor perceptible, an exploratory operation is, as a rule, still advisable in order to carry out radical or palliative treatment.

5. That where the disease is too extensive for any radical operation to be done, the palliative operation of gastro-enterostomy, which can be done with very small risk, may considerably prolong life and make the remainder of it much more comfortable and happy.

6. That some cases, thought at the time to be cancer, too extensive for removal, may, after gastro-enterostomy, clear up completely and get quite well.

7. That in cases of disease of the cardiac end of the stomach too extensive for removal, the operation of gastro-enterostomy may considerably prolong life and prove of great comfort to the patient by preventing death by starvation.

8. That even where the disease is too extensive either for removal or for a gastro-enterostomy being performed with a fair chance of success, the operation of jejunostomy may occasionally prove of service to the patient.

9. That where a radical operation can be performed, the thorough removal of the disease may bring about as much

relief to the patient as does the operation for the removal of cancer in the breast, uterus, and other organs of the body, and that in some cases a complete cure may follow.

A great improvement in the permanent results can be obtained by recognizing and taking advantage of the "area of immunity from cancer," demonstrated by Mayo. Here we note that, with the exception of 17.4 per cent. of the cases (viz., those occurring in the cardia, 8 per cent.; in the posterior wall, 4.7 per cent.; involving the whole stomach, 4.7 per cent.), cancer involves the pyloric area. This "immune area" can be preserved in gastrectomy, and furthermore all but that portion can be safely removed, permitting the surgeon to go wide of the primary focus, thus diminishing the liability of recurrence *in loco* or in the adjacent glands.

It seems to me, however, that the surgeon has a still greater field, which up to the present time has been grossly neglected, viz., *the prophylaxis of carcinoma of the stomach.* That carcinoma of the stomach can be prevented by the removal or cure of the conditions which lead to its production, it seems to me, is a perfectly justifiable conclusion, from our present knowledge of the pathologic conditions which precede and predispose to produce carcinoma of the stomach.

As shown by the epoch-making article of Professor Von Mikulicz, "Die chirurgische Behandlung des chronischen Magengeschwürs." (*Mittheilungen aus den Grenzgebieten der Medicin und der Chirurgie*). It is estimated that on an average 4 per cent. to 5 per cent. of the race suffer from gastric ulcer, and one-fifth die as a result of these gastric ulcerations. Friedler found in 2200 post-mortems that in 20 per cent. of the women and 1½ per cent. of the men fresh or cicatrized gastric ulcers were present. These ulcers and scars were frequently the seat of carcinomatous degeneration; their proper treatment is, therefore, an important factor in the prophylaxis of carcinoma. That carcinoma is induced or invoked by mild and repeated sub-inflammatory irritations of normal or cicatrical epithelial surfaces is an accepted fact. The other conditions which tend to carcinoma of the stomach are those which prevent the nor-

mal emptying of the viscus, as the retention conditions of the pylorus.

The prophylactic treatment of carcinoma, therefore, involves the early relief and removal of all the conditions which tend to this retention and its sequential gastric irritation. The surgery of these conditions, in the following order, should most concern us at the present time.

The radical removal of the pylorus, even for non-malignant disease, cannot be considered, except for complete occlusions, as it involves a mortality not to be overlooked. However, the relief of the obstructive conditions can be overcome by a safe and very satisfactory operation,—gastro-enterostomy. The results in malignant and non-malignant cases may be gleaned from the following statistics:

GASTRO-ENTEROSTOMY.

Author.	Year.	Disease.	Cases.	Recovery.	Deaths.	Mortality. Per cent.
Robson	1900	.....	1978	...	...	36.4
	(This series of 1978 evidently has many duplicates, as it is made by adding up several series of cases.)					
Mayo Brothers	1902	Cancer, etc.	107	97	10	9.0
Chlumsky in cases of Mikulicz	1881–5	Cancer, etc.	35	12	23	65.71
	1886–90	Cancer, etc.	114	61	53	46.47
	1891–6	Cancer, etc.	401	265	136	33.91
To June,	1897	.....	...	...	24	32.5
Czerny	1897	.....	53	(All with Murphy button)	...	24.5
Keen	1898	.....	7	3	4	57.1
Hochenegg	1897	Cicatrices	3	3	...	0.0
	1897	Cancer	3	2	1	33.0
Ewald's Clinic	1894–7	.....	25	9	16	64.0
	1898	.....	11	...	..	64.7
Kappeler	1887–98	31 Cancer, 8 Ulcer, etc.	39	27	12	30.76
Carle and Fantino.	1901	24 Cancer	24	15	9	37.5
	1901	27 Stricture	27	.	1	3.8
	Carle and Fantino's mortality of 3.8 per cent., so much referred to, is for *stricture* only.					
Korte and Herzfeld	1902	Anterior Method	10	7	3	30.0
	1902	Posterior Method	20	16	4	20.0

Author.	Year.	Disease.	Cases.	Recovery.	Deaths.	Mortality. Per cent.
Eiselsberg	1897–1900	.....	37	32	5	13.5
Terrier	1902	Cancer and Ulcer	22	21	1	4.54
Kronlein	1902	Cancer	74	...	...	24.3
Murphy	1903	Cancer, Ulcer, etc.	18	15	3	16.6
Hartmann (Paris).	1900	.....	40	32	8	20.0

PERSONAL CASES.

Males, 13. Females, 6. Average age, 41.7 years.

	Males.	Females.	
Pyloric Obstruction	2	2	..
Carcinoma Pylorus	2	..	1 death.
Carcinoma Stomach	4	1	1 death.
Ulcer Stomach	3	1	1 death (continued hæmorrhage).
Dilatation of Stomach	1	1	..
Gastroptosis	1	..	..
Vicious Circle	..	1	..
	13	6	3

Anterior Method	4
Posterior Method	13
Posterior with Entero-enterostomy	1
	18

Average time of passing button, sixteen days.

COMPARISON OF ANTERIOR AND POSTERIOR METHODS.

	Anterior.		Posterior.	
	Cases.	Mortality. Per cent.	Cases.	Mortality. Per cent.
Chlumsky	231	38.09	152	35.52
Mayo (W. J. and C. H.)	83	....	24	.....
	(Results equally good.)			
Kappeler	8	60.0	10	33.0
Carle and Fantino	12	33.0	10	40.0
Korte and Herzfeld	10	33.0	20	40.0
Terrier	..	....	22	4.54

The operative technique was as follows:

Mayo Brothers. Button, either anterior or posterior.

Czerny. Button, posterior.

Kocher. Suture, posterior.

Mikulicz (benign). Suture, anterior.

Mikulicz (malign). Button, anterior.

Carle and Fantino. Posterior only.

Terrier. Posterior only.

Jacobson ("Text-Book of Operative Surgery"). Halsted's method of suture best. Posterior gastro-enterostomy with the button gives as good results as any other method.

Mayo Robson has used the following successfully: (1) Simple suture, (2) Senn's plates, (3) Robson's bobbin, (4) Murphy button. Prefers No. 3.

Keen. In benign cases, slight difference between anterior and posterior methods. In cancer, posterior more desirable. In non-malignant cases, gastro-enterostomy preferable to pyloroplasty.

Monprofit (France) uses the anterior method only when the posterior is contraindicated by the anatomic conditions. The functional results are much more defective than in the posterior or in Y. As between the posterior method and that in Y, the functions are about the same. As Roux's operation (in Y) is more difficult and takes longer, he uses the posterior method in cachectic patients. Silk sutures always; no mechanical devices.

Kappeler resects stomach, if possible, instead of performing gastro-enterostomy.

Hochenegg prefers posterior method, which avoids compression of the colon and kinking of the small intestine.

Gastro-enterostomy may be done as a preliminary operation, as advised by Quénu and Lauenstein. The patient gains in strength, and the tumor, no longer irritated, may decrease in size; so later pylorectomy may be undertaken.

Eiselsberg (1901) in a woman of thirty-four made the following operations in succession: Jejunostomy, gastrotomy, jejunorrhaphy, posterior gastro-enterostomy, and, lastly, gastrorrhaphy. Recovery.

Influence of Gastro-Enterostomy on Gastric Function.—Kovesi. Man of fifty-six years, with lead poisoning, and symptoms of gastric trouble for eight months. Pyloric cicatrix found. Repeated examinations of gastric juice after operation showed acidity and decreased proportion of hydrochloric acid

much lessened. Amylolysis increased; saccharification more complete. The organ, however, remained dilated, and its motor power was but slightly increased. Our personal experience in this non-malignant case was most gratifying, and the operation will be performed with increasing frequency and, I am sure, with great benefit to the patients; in malignant cases it promises but little.

The removal of the pylorus in fibrous stricture or in complete cicatrical closure gives most gratifying results, considering the condition. The general results of pylorectomy for all conditions may be estimated from the following statistics:

PYLORECTOMY.

Author.	Year.	Disease.	Cases.	Recovery.	Deaths.	Mortality. Per cent.
Robson	1900	Cancer, etc.	572	398	174	30.4
Von Hacker-Billroth	1885	Cancer, etc.	18	8	10	55.0
Winslow	1885	Cancer, etc.	59	17	42	71.0
Rydygier	1885	Cancer, etc.	48	17	31	64.0
Jonnesco	1892	Cancer, etc.	130	46	84	65.0
Wölfler	1888–96	Cancer, etc.	219	..	...	31.2
Hahn	1898	Cancer, etc.	28	18	10	35.6
Gussenbauer	1898	Cancer, etc.	13	9	4	35.7
Von Hacker	1898	Cancer, etc.	9	8	1	11.1
Eiselsberg	1897–1900	Cancer, etc.	8	7	1	12.5
Ewald	1894–97	Cancer, etc.	12	3	9	75.0
	1898	Cancer, etc.	6	..	...	62.0
Carle and Fantino	1901	Cancer, etc.	...	...	...	20.0
Hartmann (Paris)	1900	Cancer, etc.	20	15	5	25.0
Brauer	1885	Cancer, etc.	72	17	55	76.0
Kocher	1898	Cancer, etc.	57	52	5	8.78
Maydl	1899	Cancer, etc.	25	21	4	16.0
Rydygier	1901	Cancer, etc.	25	8	17	66.0
Czerny	1881–98	Cancer, etc.	29	18	11	39.0
Morison	1901	Cancer, etc.	16	9	7	45.0
Kronlein and Schlatter	1881–88	Cancer, etc.	4	1	3	75.0
	1888–98	Cancer, etc.	20	18	2	10.0
(Included is Schlatter's total gastrectomy.)						
Murphy	1903	Cancer, etc.	14	10	4	28.6

KOCHER'S METHOD.

		Cases.	Recovery.	Deaths.	Mortality. Per cent.
Kronlein		19	9	10	....
Czerny		21	13	8	....
Kocher	To 1894	25	21	4	28.6
	since	10	9	1	....
Watten		2	1	1 (pneumonia).	

PERSONAL CASES.

Males, 11. Females, 3. Average age, 40.5 years.

	Males.	Females.	
Carcinoma Pylorus	3	1	2 deaths.
Carcinoma Stomach	1	..	1 death.
Ulcer Stomach	2	..	..
Ulcer Stomach (Perforating)	2	1	1 death.
Pyloric Obstruction	3	..	..
Gastroptosis	..	1	..
	11	3	4

The results in complete gastrectomies are as follows:

1. Conner (Cincinnati); patient died on table.
2. Schlatter (Zurich); lived eleven months.
3. Brigham (San Francisco); alive two years after.
4. Delatour (Brooklyn); alive seventeen months after.
5. Richardson (Boston); died at eleven months.
6. McDonald (Albany); alive eighteen months after.
7. Chavasse (Birmingham); died.
8. Noble (Philadelphia); died on table.
9. Bernays (St. Louis); died thirty-six hours after.
10. Ricord (France); stomach, first part of duodenum, part of pancreas, alive eleven months after.
11. Boeckel; too recent.
12. Harvie; too recent.
13. Dr. Carvalho (Brazil); reported ten days after, alive.

These results are not discouraging, considering the extent of tissue involved at the time of operation.

Effect of Adhesions.—Of 542 cases of carcinoma of the pylorus, in 370 adhesions were present (Gussenbauer and Winiwarter).

If adhesions are extensive, 72.5 per cent. mortality.

If no adhesions, 27.2 per cent. mortality (Haberkant).

Two cases, no adhesions; two recoveries.

Seven cases, slight adhesions; four recoveries; three deaths.

Five cases, extensive adhesions; no recovery; five deaths (Von Hacker and Billroth).

The changes in technique practised by Mr. Moynihan (Leeds) may give better immediate and permanent results. The plan is based on good anatomic lines, and careful consideration has been given the routes of distribution of the cells in the lymph spaces and lymphatic drainage tracts and filter glands.

The results of the various operative techniques may be judged from the following statistics:

Pylorectomy with end-to-end anastomosis, 148 cases; 56 deaths; 37.8 per cent.

Pylorectomy with terminal and lateral anastomosis, 64 cases; 10 deaths; 15.6 per cent.

Pylorectomy with lateral anastomosis, 54 cases; 24 deaths; 44.4 per cent.

Pylorectomy by invagination, 4 cases; 4 deaths; 100 per cent.

Pylorectomy by two stages, 3 cases; 0 deaths; 0 per cent.

Rydygier resects a large portion, two to four inches beyond the apparent limits of the growth.

Hochenegg uses no lavage, thinks it is insufficient, and fatigues the patients. He uses Kocher's method only; believes pylorectomy is always indicated when the tumor is not too adherent, when there are no metastases in the peritoneum or the great omentum, and the patient's condition allows it. Extent of the growth is no contraindication, for Maydl resected three-fourths of the stomach, with a survival of seven years. Nor is adhesion to the pancreas a contraindication any longer.

Hartmann (of Paris). Half of his patients were living at the time of report. He attributes this to a special technique, removing the lesser curvature and the glands along the right branch of the coronary artery, as follows: The stomach is pulled forward, the right branch of coronary is ligated, elastic forceps are then placed protecting the greater tuberosity and the cardia. The pylorus is thrown back on the right lip of the

incision, and the gastroduodenalis is found at the bottom of the pancreaticoduodenal groove and ligated. The diseased mass is then removed.

Kocher. If many adhesions exist, circular resection is less dangerous than excision of ulcer. In suspected cancer, when in doubt, operate. Advocates resection of pylorus with absolute closure of wound, then make a posterior gastro-enterostomy.

"If we do not prolong life by a single day, the operation is still justified, in my eyes." (Mikulicz.)

Rydygier (*Revue de Chirurgie Abdominale*, 1901) gives details of a case of pylorectomy in a woman of forty-nine, operated on nineteen years before for ulcer penetrating the pancreas, a part of which was excised. By removing a conical segment of the posterior wall of the duodenum, direct suture of the stomach and duodenum was possible without folds. The patient's digestion is very good, and she works hard. Five accouchements since operation.

The rapid gains in weight and the complete restoration in health in the non-malignant pylorectomies make one think seriously of pylorectomy in place of pyloroplasty, at least, as it has been performed. The permanent results of pyloroplasty have been anything but gratifying. If pyloroplasty is to become one of the standard operations, it must be so performed that no adhesion or fixation of the pylorus to the anterior abdominal wall follows it as a second pathologic condition.

The results of stomach operations in general are seen in the following statistics:

Guinard, of Paris (*Revue de Gynécologie*, 1896). Mortality has been steadily lessening, as shown by the following collected cases:

Author.	Year.	Cases Corrected.	Recovered.	Died.	Mortality. Per cent.
Hahn	1883	27	4	23	85.18
Kramer	1885	72	17	55	69.9
McArdle	1887	62	27	35	56.4
Guinard	1891	149	63	86	57.71
Zeller	1892	117	54	62	53.0
Haberkant	1894	207	114	93	54.4
Wölfler, 1896, experience of fifteen German surgeons:					
		92 cases before 1888			56.4
		173 cases, 1888–96			31.2

In 75 cases, Mikulicz found 29 inoperable; in 17 more, exploratory incision being made, they were found inoperable also; in 21 gastro-enterostomy was done; in 8, resection.

Doyen has made 146 operations for stomach diseases, with 22 deaths. In 66 cases of carcinoma, 20 died. Prefers Roux's method (gastro-enterostomy in Y).

Stendel. Stomach operations, Czerny's Clinic. Up to the end of 1897, 192 operations were performed (not including gastrostomies), with an average mortality of 29 per cent.

Years.	Pylorectomies.	Gastro-Enterostomies.	Pyloroplasties.	Exploratory Laparotomies.	Other Operations on Stomach.	Total.	Mortality. Per cent.
1881–89	13	14	0	11	4	49	4.5
1890–93	7	17	3	5	2	34	18.0
1894–95	2	23	7	8	4	44	27.0
1896	4	28	1	2	0	35	34.0
1897	3	28	0	4	2	37	16.0
1881–97	29	110	11	30	12	199	29.0

In feeble subjects, Czerny has tried to divide the operation into two stages,—gastro-enterostomy and then pylorectomy. Patients, however, nearly always refused to submit to the latter until too late.

No pyloroplasties since 1896 on account of bad results.

Since June, 1896, sutures have been abandoned in favor of the Murphy button. In 53 gastro-enterostomies with the button, the mortality was 24.5 per cent. In gastro-enterostomy with suture it was 36.8 per cent.

Stomach Operations.—Chlumsky. (Mikulicz's Clinic.) June, 1897–August, 1898. Seventy-eight gastro-enterostomies; 21 died in first 30 days (26.92 per cent.).

1884–1899. One hundred and fifty-five gastric operations; 45 died in first 30 days (29.60 per cent.). One hundred and fifteen malignant growths; 40 died (34.78 per cent.). Thirty-four ulcers; benign strictures; 2 died (5.87 per cent.). First 4 per cent. by Wölfler's method.

"1891–1896. Von Hacker's method alone used. In all 13 per cent. by Wölfler's method, 5 deaths. Forty-three per cent. by Von Hacker's method, 14 deaths.

STATED MEETING, JUNE 1, 1903.

The President, RICHARD H. HARTE, M.D., in the Chair,

CASES ILLUSTRATING FRACTURE IN THE LOWER ANIMALS.

DR. W. BARTON HOPKINS exhibited for Dr. Charles B. Penrose and himself two specimens. The first was the femur of a deer which had been shot by Dr. Penrose, the bone showing the results of an old gunshot fracture.

Fractured Left Humerus of a Black-Tail Deer.—This animal was shot in the Sawtooth Mountains of Idaho during the last part of September, 1901. Horns had started, and the animal was therefore probably born in the spring of 1900, being at the time of death about fifteen or sixteen months of age. He was with two other deer, and appeared to get along as easily and as quickly as they did. There was no external mark on the skin to show the old wound. The skin was adherent over area about size of little finger-nail to the mass of callus. Tissues around seat of fracture were healthy, showed no signs of acute inflammation. A few drops of thick purulent material were found in a small pocket of fibrous tissue. Several small fragments of lead about size of No. 9 shot were found in fibrous tissue surrounding callus, and one free spicule of bone about one-half inch long by one-third inch wide, which was not united to humerus or to callus.

This animal had probably been shot the previous year in September, the open season, when a fawn. The uninjured right humerus was preserved for comparison. The animal was in as good condition as any of the eleven or twelve deer which were shot in that region.

The second specimen represents a gunshot fracture of the tibia of an apparently healthy duck, of perhaps two or three months' standing. When the bird was killed, the wounds of entrance and exit were still open, the limb was very much swollen,

and was shortened. There was no union of fragments. Preparation of the bones demonstrated excessive formation of callus about the seat of fracture.

Both of these specimens illustrate how motion at the seat of fracture produces excessive callus, the deposition at the latter being further increased if great deformity is present. In the one, the humerus of the deer, the mass of callus finally prevented motion and firm union resulted; in the other, the tibia of the duck, a like result would probably in time have occurred had the bird lived. Both specimens are interesting examples of gunshot fracture in the lower animals.

DR. W. BARTON HOPKINS said that the specimen showed very firm consolidation of the fracture. Compared with the corresponding bone of the opposite side, it is seen that practically no rotation of the fragments has occurred. There is shortening, angularity, and marked overlapping, but no rotation. This may be attributable to the position of the humerus in the deer, which is well up against the thorax and supported by it.

DR. JOHN H. BRINTON asked if any hypothesis could be hazarded as to the condition and possible position of the deer for the two or three weeks immediately following the injury. He then cited an instance of callus formation in a dog. Treatment was suggested a week after the animal had received a fracture of the leg. By that time an enormous amount of callus had been formed around the site of fracture. A plaster dressing was applied to immobilize the parts. In eight or nine days this became loose and a new one was supplied. It was then found that the excessive amount of callus had been almost entirely absorbed, this process taking place rapidly, as soon as the cast performed the work of the callus. This instance suggested that union in fractures of human bone may be more rapid than is usually thought. In replying to Dr. Brinton's question, Dr. Hopkins said that it must be assumed that an agile animal like the deer would do as a dog does under like circumstances,—go on three legs as long as there was pain in the injured limb. The probability in this case is that the deer kept his foot off the ground until healing of the fracture took place.

AN APPARATUS FOR MAKING TRACTION UPON THE KNEE FOR THE REDUCTION OF DISLOCATION OF THE HIP.

Dr. Oscar H. Allis exhibited an appliance which consists of two flanges that fit the thigh and a parallel bar on each side that can be pushed away from the inner flanged portion. The thigh is first bandaged, the apparatus applied, and several turns of bandage taken around the entire apparatus. By means of two thumb-screws on each side, the parallel bars are then pushed away from the flanges, and the bandages around them and the leg are made as tight as desired. If traction loosens the bandage, as it practically always does, a turn of the screws makes it tight again, this being the valuable feature of the apparatus. The bars carrying the flanges are prolonged in front and carry a transverse handle between their ends.

Dr. W. Barton Hopkins, on whose leg the apparatus had been applied for purposes of demonstration, said that after feeling it on his thigh he had one suggestion to offer regarding its improvement. He would prolong the handle about eight inches on each end and terminate it with knobs. This leverage would afford a powerful means of rotation when added to the purchase of the instrument on the leg.

Dr. Allis, in reply to the suggestion of Dr. Hopkins, said that the leverage exerted by one hand holding the ankle while the other made traction upon the instrument was sufficient, and was more safe than would be the powerful rotation afforded by the expedient suggested. The experience of many surgeons is that occasionally a case is found in which reduction of the dislocation is impossible. Bigelow has dealt with such cases by throwing the head of the femur in such a way as to tear the ligaments. With the apparatus exhibited, and the one hand manipulating the ankle, the bone can be teased back into its proper place in the same line in which it passed out and without the use of undue force and the risk of fracture.

AN ACCIDENTAL CURE OF A CASE OF PAPILLOMA OF THE BLADDER.

Dr. Orville Horwitz reported the case of a man who was first seen by him in consultation with Dr. Louis Breechman in September, 1897. He was then sixty-three years of age. He

stated that for two years he had occasionally noticed that he passed bloody urine, unaccompanied by any other symptom. The blood at first voided was small in quantity. As time went on the attacks of hæmaturia became very frequent, and the amount of blood lost was greater. Occasionally a good-sized clot would be passed. During the past three months there has been an increased frequency of micturition; the urine being voided about every three hours during the day and twice at night. This condition has never been attended with pain. The patient stated that at the outset of his complaint the blood was passed infrequently, that the urine was blood-stained, and had continued so for many weeks. He observed that the voidance of bloody urine was apt to follow over-exertion, constipation, or coition.

Examination of the urine showed it to be cloudy, alkaline, with a deposit of pus and phosphates, together with mucous threads accompanied by clots of blood. Albumen was present in large quantities. Examination by the microscope revealed pus and epithelial cells in large quantities together with crystals of hæmatobin. No casts were found.

The cystoscopic examination detected a large pedunculated papilloma in the vicinity of the left ureteral orifice. An operation was advised, which was positively declined. The hæmaturia abated under hygienic, local, and constitutional treatment. The cystitis decreased, and the individual enjoyed a period of three or four months of comparative comfort. Occasionally there would be a slight trace of blood in the urine, but the amount was so much lessened as to cause but little apprehension on the part of the individual, whose general health was excellent.

Whilst absent from the city during the summer, Dr. Horwitz's assistant was called to visit the patient, who was suffering with an attack of retention of urine caused by a blood-clot, the attack having followed a long walk in the country. Three similar attacks occurred within the next year, each having followed over-exertion. The first two were relieved with much difficulty; on the third occasion retention of urine had existed for fourteen hours. Every effort had been made to evacuate the contents of the bladder without success. The patient was in great pain, walking up and down the room, with the body bent well forward, so as to relieve the pressure on the bladder as much as possible. A well-marked pyriform tumor existed above the pubic bone ex-