Senn (N.)

THE SURGICAL TREATMENT

OF

PYLORIC STENOSIS

WITH A REPORT OF FIFTEEN OPERATIONS
FOR THIS CONDITION

SENN.

The Surgical Treatment of Pyloric Stenosis, with a Report of Fifteen Operations for this Condition

BY

N. SENN, M.D., PH.D.

PROFESSOR OF PRACTICE OF SURGERY AND CLINICAL SURGERY IN RUSH MEDICAL COLLEGE; ATTENDING SURGEON TO THE PRESBYTERIAN AND EMERGENCY HOSPITALS; PROFESSOR OF SURGERY, CHICAGO POLICLINIC; SURGEON IN CHARGE OF ST. JOSEPH'S HOSPITAL, CHICAGO, ILL.

Reprinted from the MEDICAL RECORD, *November 7 and* 14, 1891

NEW YORK
TROW DIRECTORY, PRINTING AND BOOKBINDING CO.
201–213 EAST TWELFTH STREET
1891

THE SURGICAL TREATMENT OF PYLORIC STENOSIS, WITH A REPORT OF FIFTEEN OPERATIONS FOR THIS CONDITION.[1]

STRICTURE of the pylorus, sufficient in degree to give rise to obstruction, slowly but surely leads to a series of pathological changes incompatible with life, and death from marasmus will eventually result, irrespective of the nature of the primary lesion which caused the stenosis. The progressive narrowing of the lumen of the pylorus causes retention of food in the stomach, which, failing to undergo proper gastric digestion, acts the part of an irritating foreign substance, and in a short time produces a diffuse catarrhal inflammation. The retention in the stomach of imperfectly digested food is followed by fermentation, which still further impairs gastric digestion and adds another causative element in the production of dilatation of the organ. The accumulation of food, and the products of catarrhal inflammation in the stomach, increase as the pyloric outlet of the organ is diminished by the stricture, and dilatation is brought about by the weight of the stomach contents, the weakening of its walls by the secondary catarrhal inflammation, and by the elastic expansion of the organ by the gaseous products of fermentation. In chronic pyloric obstruction I have repeatedly evacuated from the stomach over a gallon of fluid, containing solid particles of food, through an elastic siphon stomach-tube. In one instance fragments of the pulp of an orange were observed in this

[1] Address on Surgery delivered before the New York State Medical Association, October 28, 1891.

manner three months after the orange was eaten, showing that when the stenosis has reached a certain stage solid fragments of food may be retained in the stomach, in an undigested state, for weeks and months. In reference to the secondary lesions of the stomach following pyloric stenosis, the train of symptoms is very much the same whether the primary disease is of a benign or malignant nature. Death eventually occurs, not from the disease which has produced the stricture, but from the secondary lesions which develop in consequence of the mechanical obstruction. Irrigation of the stomach, rational use of internal remedies, a carefully selected diet, the use of electricity and massage exert a beneficial influence in the retardation of the secondary lesions caused by the obstruction. They are the most useful means which the modern physician employs in the treatment of such cases to prevent and combat the secondary lesions, but the employment of all these valuable therapeutic resources can at best only postpone, but not obviate, the inevitable fatal termination.

Stricture of the pylorus is a surgical affection, and should be treated as such with the same right and for the same reasons as a stricture of the œsophagus, rectum, or urethra. Reliance on medicine is as deceptive and useless in these cases as in the treatment of stricture of any other organ. Permanent relief can only be secured by prompt surgical interference.

During the last ten years abdominal surgery has widened its field of application and usefulness, and now deals successfully with the surgical affections of every one of the intra-peritoneal organs. Gastric surgery has a short but eventful history. Within a few years hundreds of operations have been performed on the stomach for various indications, and many of them have proved eminently successful. Although the hopes first entertained in reference to the possibilities of extensive resections for malignant disease have not been realized, the results obtained by operative treatment for obstructive

lesions have surpassed all expectations, and constitute one of the triumphs of modern surgery. It must not be forgotten that gastric surgery is still in its infancy, and I am quite confident that in less than ten years from now the means for an early accurate diagnosis of the different surgical affections of the stomach will have been so much improved, and the technique of the different operative procedures will have reached such a degree of perfection, that surgeons will then deal with the different localized affections of this organ as successfully as the gynecologist now does with the different affections of the uterus and its appendages. I propose on this occasion to discuss briefly the surgical treatment of pyloric stenosis. I shall divide the subject, in reference to the nature of the obstructive cause, into, 1. Operative Treatment of Cicatricial Stenosis of the Pylorus. 2. Operative Treatment of Carcinoma of the Pylorus. With very few exceptions stricture of the pylorus is caused either by cicatricial contractions following the healing of an ulcer in this locality or a carcinoma. It is very rare indeed to find obstruction here caused by other conditions, such as a non-malignant tumor, congenital stenosis, a twist, or flexion.

1. **Operative Treatment of Cicatricial Stenosis.**—Cicatricial stenosis of the pyloric orifice of the stomach frequently follows as a remote sequela after the healing of an ulcer or traumatic defect in this part of the stomach. The development of the stenosis is a slow process, as it depends upon the formation and contraction of cicatricial tissue which is produced at the site of the former trauma or ulcer. The formation of an excessive amount of granulation tissue in a surface wound or ulcer of the stomach takes place in consequence of the continued irritation caused by the presence of food and digestive fluids, and on this account cicatricial contraction so often follows the healing of a wound of the mucous membrane or ulcer of this organ. A cicatricial stenosis of the pylorus gives rise to symptoms of obstruction at this point—vomiting, retention of food, catarrhal inflammation

followed by progressive dilatation of the stomach. Patients suffering from this affection are usually treated for months and years for dyspepsia or indigestion until a careful examination of the stomach reveals the existence of the obstruction and great distention of the stomach, when the diagnosis is often changed to carcinoma of the pylorus. The diagnosis of cicatricial stricture of the pylorus should be based on the clinical history of the case, which usually points to the existence of ulceration months and years before, the use of the siphon stomach-tube, and inflation. The clinical history usually reveals the existence of disturbed digestion years ago, caused by an unhealed ulcer, and later by the gradually increasing obstruction. For a time the compensatory hypertrophy of the walls of the stomach balances the mechanical difficulties caused by the stricture; but when this is no longer the case, the walls of the stomach become attenuated and dilatation of the organ follows as a constant and inevitable result. At this stage the elastic stomach-tube is of great diagnostic value. By its use the overloaded stomach is emptied of its contents and the amount of fluid removed often furnishes valuable information regarding the degree of dilatation, while examination of the contents removed often reveals valuable diagnostic points. After the stomach has been thoroughly washed out, its size and location can be accurately outlined by inflation. Even when the stomach is in a normal condition it can be fully distended by inflation from above, and when the pyloric orifice has been diminished in size very little, if any, air passes beyond it when the organ is distended for diagnostic purposes. Air should be forced through the stomach-tube slowly and uninterruptedly from a large rubber balloon, until the contour of the stomach can be outlined on the surface by inspection, palpation, and percussion, which will not only accurately indicate its size, but this method of examination will also determine accurately its anatomical location and relation to surrounding organs. When the dilatation is very

marked, it is not uncommon to find the axis of the organ changed from horizontal to a nearly perpendicular line, and in such cases the great curvature is often found in the left iliac fossa.

The absence of a tumor in the pyloric region speaks in favor of a cicatricial stenosis, but does not preclude the possible existence of an annular malignant stricture. A cicatricial stricture of the pylorus is almost certain to lead to a fatal termination in from three to four years from marasmus, unless the mechanical obstruction is remedied by surgical interference, as a stricture in this locality always manifests an intrinsic tendency to progressive contraction, and finally completely interrupts the entrance of food from the stomach into the intestines. The operative treatment of a cicatricial stricture at the pyloric end of the stomach consists in pylorectomy, digital divulsion of the stricture through a wound in the stomach, in the formation of a partly new pylorus by the pyloro-plastic operation of Heineke-Mikulicz, or, in establishing a new outlet from the stomach into the upper portion of the small intestine by making a gastro-enterostomy.

Pylorectomy.—The mortality of pylorectomy, even in the treatment of cicatricial stenosis, has been so great—about fifty per cent.—while the less heroic procedures have yielded equally satisfactory functional results, that we may take it for granted that this operation will be entirely abandoned in the treatment of this form of pyloric obstruction.

Digital Divulsion of Cicatricial Strictures of Pyloric Orifice of Stomach.—In 1883 Loreta, of Bologna, introduced a new method of treating non-malignant strictures of the pylorus, and later published a number of successful cases. The operation devised by him consists in opening the stomach a little nearer the pyloric than the cardiac extremity, and passing first the right index-finger through the strictured portion, and later also the left, and then separating them, as he did in the first case more than three inches. Considerable force is usually required

in dilating the stricture to this extent, and during such forcible stretching there is always danger of tearing through the entire thickness of the wall of the pylorus. The wound in the stomach is closed in the same manner as after gastrotomy for other purposes. The stomach should be thoroughly emptied by irrigation with a mild antiseptic solution before the operation, and during the stretching process the visceral wound should be drawn well into the abdominal incision.

To the immediate risks of Loreta's operation, rupture of the pylorus and dangerous hemorrhage, must be added recurrence of the stricture, which is certainly one of the common remote consequences following treatment of cicatricial strictures by rapid dilatation wherever the stricture may be located. In this particular it can hardly be assumed that stricture of the pylorus constitutes the only exception. Notwithstanding that a number of successful operations of this kind have been reported, and the operation is being strongly urged by a number of able surgeons, notably by Barton, of Philadelphia, it will undoubtedly soon be forgotten, as it is more dangerous and uncertain in its results than the pyloroplastic operation of Heineke-Mikulicz, which for many reasons is sure to take the place of all other operations in the surgical treatment of non-malignant strictures of the pylorus.

Pyloroplasty.—The safest, and functionally most efficient, operation for cicatricial stenosis of the pylorus is the one devised by Heineke and Mikulicz nearly at the same time. It is a procedure which well deserves the name it bears—pyloroplasty, as it not only removes the mechanical obstruction, but, at the same time, creates a new pylorus. This operation was first planned and practised by Heineke, of Erlangen, and eleven months later Mikulicz, ignorant of Heineke's work, made the operation in exactly the same manner. The operation is made by cutting the anterior wall of the strictured pylorus, and extending the incision about an inch toward the stomach, and the same distance in the direction of the duodenum.

The straight incision in the long axis of the pylorus divides the stricture, and the contracted pylorus becomes the posterior wall of the new pylorus by retracting the margins of the wound on each side, at the centre, with tenacula, and suturing the wound in an opposite direction to the incision, that is, transversely to the long axis of the stomach. The new pylorus is made up of tissue, taken partly from the anterior wall of the stomach and partly from the duodenum, the posterior wall being composed of the narrow, contracted pylorus. In suturing the wound it is advisable to tie the sutures from each angle of the wound, tying the central sutures last. Two rows of sutures, deep and superficial, are employed, the same as in closing a wound of the stomach or intestines. Recurrence of the stricture is a physical impossibility, as the new pylorus is composed mostly of healthy tissue, and the danger attending the operation is not greater than that which accompanies an ordinary intentional wound of the stomach or intestines. The results of this operation, obtained in eight cases which have so far been reported, have been very satisfactory both in reference to the immediate effects of the operation and the functional results. In this connection I will give the details of two cases of cicatricial stenosis of the pylorus, in which I employed this procedure, and in both instances with most gratifying results.

Case I. *Cicatricial Stenosis of Pylorus — Pyloroplasty—Recovery.*—An account of this case was published by Dr. F. J. Groner, of Big Rapids, the attending physician, in *The Physician and Surgeon*, March, 1890. The patient was the Reverend Mother Superior of the Convent of Mercy, Big Rapids, Mich., aged forty-seven. General health good until the early part of the winter of 1888, when she began to suffer with symptoms which suggested the existence of pyloric obstruction. The usual treatment for indigestion proved of no avail. Vomiting at variable periods after eating was a conspicuous symptom, and was always followed by relief. On one

occasion meat eaten one hundred hours before was recognized in the vomited matter. Vomiting commenced in March, 1889. The symptoms became greatly aggravated during the month of June. The use of the stomach-tube afforded great relief. In the latter part of May the patient consulted me, at the request of her attending physician, and from the clinical history and the symptoms then present, I had no hesitation in corroborating the diagnosis previously made by Dr. Groner—cicatricial pyloric stenosis.

The obstruction evidently became rapidly aggravated, so that even liquids were no longer retained in the stomach. The patient's normal weight was one hundred and ninety-nine pounds, of which she lost fifty pounds during her illness.

The operation was performed, July 16, 1889, at the Mercy Hospital, Big Rapids, Mich. I was ably assisted by Drs. Groner, Barth, Burkart, and Bigelow. The patient was thoroughly prepared for the operation by washing out the stomach with Thiersch's solution. Chloroform was used as an anæsthetic. The great thickness of the abdominal wall made it somewhat difficult to bring the pyloric end of the stomach well forward into the wound. The pylorus was a circular mass of cicatrical tissue, its lumen not much larger than an ordinary lead-pencil. The incision was carried well toward the stomach and duodenum, in order to obtain sufficient healthy tissue for the new pylorus. The longitudinal wound was transformed into a transverse wound, and united by two rows of fine silk sutures. The lumen of the new pylorus was large enough to admit two fingers. She vomited several times after the operation, but this the patient attributed to the morphia which was administered. For twenty-four hours the stomach was kept perfectly empty. After this time liquid food was administered in small quantities at short intervals. No further untoward symptoms occurred, and the external incision healed by primary intention. Six weeks after the operation the patient re-

sumed her ordinary duties, which consisted of superintending three schools, each fifty miles apart, and the trying task of presiding over two hospitals. Appetite and digestion at this time were perfect. The overwork brought on severe and obstinate attacks of intercostal neuralgia, which required morphine to relieve the pain. This late complication retarded materially the final complete recovery. In December the patient was in perfect health and had regained her former weight. At present there are no indications of recurrence of gastric disturbance, and the patient continues her arduous work with the same energy and efficiency as before her illness. It is noteworthy to state that in this case the patient does not recall any symptoms which would indicate the existence of an ulcer of the pylorus at any time before the last illness, and yet it is almost certain that, probably years before, she was the subject of an extensive circular ulcer at or near the pyloric orifice. The stomach was only moderately dilated, and the walls, if anything, were thicker than in a normal condition. It is evident that the obstruction had existed for a long time, and had resulted in a compensatory hypertrophy of the coats of the stomach, and that at the time of operation dilatation of the stomach and attenuation of its walls were progressing hand in hand. I have no doubt that a few months later both of these conditions would have been greatly aggravated. A timely resort to operative treatment in this case prevented the full development of the remote secondary lesions following pyloric obstruction, and thus averted the serious organic changes which characterize pyloric obstruction of long standing, and which, under these circumstances, often never completely disappear, even after the stricture has been removed by operative treatment.

Case II. *Cicatricial Stenosis of Pylorus following Recent Extensive Ulceration—Pyloroplasty without Anæsthesia—Recovery.*—The second case of pyloroplasty was a Norwegian farmer, fifty-one years of age, who was

brought to the Presbyterian Hospital, in Chicago, by Dr. Boeckmann, of St. Paul, Minn., July 5, 1891. No hereditary tendency to carcinoma in his family. He states that he has been a confirmed dyspeptic for twenty years. Eight months before his admission into the hospital he suffered great pain in his stomach, which was always aggravated after meals. The pain was associated with a burning, scalding sensation in the stomach, which was most distressing several hours after meals. About this time the patient had an attack of profuse hæmatemesis which almost proved fatal. The diagnosis made at this time was ulcer of the stomach. By restriction of diet, and occasional use of stomach siphon-tube he obtained temporary relief; but for the last two months he has vomited repeatedly, usually some time after eating. At the time of admission the patient presented an anæmic appearance and was greatly emaciated. No tumor could be detected in the region of the pylorus. Chemica examination of the contents of the stomach revealed the presence of hydrochloric acid. By use of the elastic tube it was ascertained that the stomach held at least twice as much fluid as in a normal condition. From the history of the case, and the symptoms and signs presented, I was ready to endorse the diagnosis of cicatricial stenosis of the pylorus, previously made by the attending physician. As the patient was very much debilitated, his pulse intermittent and irregular, I agreed with Dr. Boeckmann that it would be unsafe to administer an anæsthetic, and that if the patient's consent could be obtained it would be advisable to operate without anæsthesia. The patient readily agreed to our advice, and heroically submitted to the somewhat prolonged operation, responding to questions, and describing his sensations during its progress. As in the former case, the stomach was thoroughly washed out with a weak antiseptic solution just before the operation was commenced. The operation was performed on the same day he reached the hospital. The external incision was made through

the median line, from the ensiform cartilage to the umbilicus. According to the patient's own statements this step of the operation caused the severest pain. The incision in the stomach and suturing of the visceral wound produced but little suffering. The stomach was found greatly dilated, its walls very vascular and considerably attenuated. The pylorus occupied its normal location, and presented, anteriorly, a tortuous and twisted appearance. The anterior wall presented otherwise a normal appearance. Digital exploration revealed a hard cicatricial mass, involving the posterior and upper part of the pylorus. An incision about two inches in length was made, parallel to the long axis of the stomach, with the strictured portion as the central point. Inspection and digital exploration now revealed a cicatricial mass posteriorly and above the incision, involving about two-thirds of the circumference of the pylorus, the lumen of which was contracted down to the size of a lead-pencil, and very much distorted. The visceral wound was treated in the same manner as in the foregoing case. Aseptic gauze was packed around the pylorus, and was kept in place from the time this part of the stomach was brought forward into the wound until the suturing of the visceral incision was completed. During the operation the patient complained of nausea, at the same time violent contractions of the stomach were observed, but vomiting did not ensue. The abdominal incision was closed by buried and superficial sutures. The operation lasted nearly an hour, and after its completion the patient was somewhat paler, but expressed himself as satisfied that the pain inflicted was not as severe as he had expected. Rectal alimentation was relied upon for three days, after which stomach feeding was resumed. The diet for a number of days was limited to liquid articles of food. The highest temperature observed was $99\frac{3}{4}^{\circ}$ F. The wound healed by primary union, and the patient left the hospital much improved in health at the end of twenty-five days. On several occasions the stom-

ach-tube had to be used after the patient commenced to take liberal quantities of solid food, as digestion appeared to be somewhat impaired. I received a letter from him two months after leaving the hospital, in which he informed me that he had gained twenty-seven pounds in weight, and was able to digest all kinds of food without experiencing any distress. Only on a few occasions was the stomach washed out after he left the hospital, for fear that undigested food might aggravate the enfeebled condition of the stomach. As I have not heard from him since, I have every reason to believe that he has been free from a relapse. The points of interest in this case are the sex and age of the patient, the short time that elapsed since the ulcer formed and symptoms of obstruction appeared, the almost complete impermeability of the pylorus by a cicatrix involving only two-thirds of its circumference, and the fact that the operation was performed without the use of an anæsthetic. The complete impermeability of the pylorus in this case was at least in part due to the tortuous course of its lumen.

The results obtained in the above cases, as well as a study of the literature on the different methods of operative treatment of pyloric stenosis, have led me to the conclusion that pyloroplasty is the safest and most successful operation in all cases in which pyloric obstruction is caused by cicatricial contraction. Pylorectomy in such cases is too dangerous an operation, and even if it should prove successful would not yield as satisfactory functional results as the simpler and safer procedure of pyloroplasty. Digital divulsion of the stricture has been followed by a much larger mortality than pyloroplasty, and the remote danger of recurrence of the stricture, for obvious reasons, is much greater than in the latter operation. Gastro-enterostomy is attended by as much, if not more, immediate risk to life than pyloroplasty, and the functional results can certainly not be as satisfactory as after pyloroplasty, because an important segment of the small intestines is permanently excluded by the opera-

tion from the process of digestion. As in the treatment of all other surgical affections of the gastro-intestinal canal, it is important, in order to secure good results, to operate early, before the obstruction has resulted in incurable secondary lesions, it is also important that an early diagnosis of the existence of pyloric obstruction should be made. For practical purposes it is immaterial to make a positive differential diagnosis between benign and malignant obstructive lesions before the abdomen is opened, as in either case operative treatment of the obstruction is urgently indicated. The existence of pyloric obstruction can be ascertained, with a reasonable degree of certainty, by the complexus of clinical symptoms which attends this condition, and the diagnostic tests which demonstrate the increased capacity of the stomach and dilatation of this organ. In reference to the presence or absence of hydrochloric acid in the secretions of the stomach as a test in the differential diagnosis between benign and malignant affection of the stomach and pylorus. Kinnicutt summarizes the results of his investigations as follows :

"The concensus of experience among clinical observers in various parts of the world is to the effect that free hydrochloric acid may be, and is, absent temporarily or otherwise in many gastric affections ; that it is absent in a very large proportion of cases of cancer of the stomach ; that its continuous presence is a diagnostic sign of great value in excluding the probable existence of gastric cancer."

Malignant Stenosis of Pylorus.—Myofibroma and other benign tumors of the stomach are extremely rare, and when present seldom necessitate surgical treatment. Sarcoma of the stomach, as compared with carcinoma, is so very rare that it is only necessary to speak briefly of carcinoma as a cause of pyloric obstruction in the consideration of malignant stenosis in this part of the stomach. It appears that in the stomach the general law is also observed that carcinoma develops in preference where

two different types of epithelial cells meet. It is a well-known clinical and pathological fact that in the stomach the disease has its primary starting-point most frequently at the pyloric or cardiac orifice, and of these two localities the pyloric is, by far, the most frequently affected. Carcinoma of the pylorus gives rise to many symptoms which suggest the existence of ulcer and cicatricial stricture. This is more especially the case in circular carcinoma, which produces obstruction quite early by infiltration of the tissues and cicatricial contraction. As soon as the internal surface of the carcinoma ulcerates, hemorrhage into the stomach is of frequent occurrence. It is not always easy, or even possible, to ascertain the existence or exact location of a carcinoma of the pylorus by any of the known physical signs or chemical tests. A circular carcinoma of the pylorus may cause death before its presence can be recognized by any known methods of physical examination. An infiltrating carcinoma of the pyloric extremity of the stomach may cause thickening of the walls of the stomach over a large area, and yet it may elude the most painstaking examination if physical signs are relied upon exclusively. In the majority of advanced cases of pyloric carcinoma, however, a distinct tumor can be felt in the pyloric region ; but often the weight of the tumor has carried that part of the stomach in a downward direction, and then the tumor may be found as low down as the level of the umbilicus. Circular carcinoma of the pylorus often causes enormous distention of the stomach, the large curvature of which often reaches as far as the pubes. In such cases the stomach is often placed in almost a vertical position—a condition which greatly aggravates the existing obstruction. It is often very difficult to differentiate between a carcinoma of the pylorus and a retro-peritoneal tumor in the same locality. Inflation of the stomach is the most reliable diagnostic procedure in such cases.

If the tumor is retro-peritoneal it becomes covered by the distended stomach during the inflation ; the previous

area of dulness disappears as the tumor becomes covered by the distended tympanitic stomach. If, on the other hand, the tumor is connected with the stomach, its relative position to the anterior abdominal wall is not changed by the inflation. A carcinoma of the pylorus may be suspected if a patient more than forty years of age gives a history of disturbed digestion dating back for several months or a year, combined with evidences pointing to pyloric stenosis. The chemical examination of the contents of the stomach for free hydrochloric acid, so much relied upon during the last few years in making a differential diagnosis between benign and malignant affections of this organ, has been found a valuable aid, but the results thus far obtained are not infallible. Hæmatemesis in persons beyond middle age, progressive marasmus, and enlargement of the cervical glands speak in favor of malignant disease. The surgical treatment of pyloric carcinoma consists either in removal of the diseased part by pylorectomy, or the formation of a new outlet from the stomach into the upper portion of the small intestines by gastro-enterostomy.

Pylorectomy.—A limited carcinoma of the pylorus, if it has not resulted in extension of the disease to adjacent organs or infiltration of the lymphatic glands behind it, furnishes a legitimate indication for a radical operation. If, however, the disease has extended beyond the walls of the stomach, pylorectomy is contra-indicated and the surgeon must be content to render the obstruction harmless by establishing a new route by which the contents of the stomach can reach the intestinal canal. If the patient objects to an operation life can be greatly prolonged and a vast amount of suffering prevented by placing the patient on a carefully selected diet and by resorting to irrigation of the stomach as often as the retention of the undigested food may render this procedure necessary. Pylorectomy has so far not yielded results which would encourage surgeons to have more frequent recourse to it

in the treatment of malignant stenosis. The great mortality of this operation and early relapses are easily explained by the fact that heretofore operations were usually performed after the patient's strength had been greatly reduced by the disease and after extension of the disease to the surrounding organs or lymphatic glands had taken place. Statistics appear to show that the results have not improved much during the last few years. At the Berlin International Medical Congress (1890) Billroth gave an account of 27 pylorectomies, all of which were performed either by himself or his assistants. Of this number 12 recovered from the operation and 15 died. Of 13 pylorectomies for carcinoma which survived the operation, 5 died after ten months, and 1 after five years and three months after the operation from recurrence. There were yet living three women at the time the report was made, of whom two had been operated upon two and one-half and four and one-fourth months. Of 6 resections of the pylorus for cicatricial stenosis 3 recovered. These results, obtained by the ablest of living surgeons, certainly leave much to be desired, and cannot fail in influencing surgeons to limit the sphere of the operation to favorable cases. The proper time for pylorectomy will come when we shall be able to recognize carcinoma of the pylorus during its incipiency, at a time when the patient's general condition is such as to be able to resist the immediate effects of the operation; when this time has come the mortality will be small and the relapses few. At present it seems to me that the operation is only justifiable where the patient's strength is fair and where the disease is limited and has not passed beyond the organ primarily affected.

Gastro-enterostomy.—Gastro-enterostomy is an operation by which an anastomotic communication is established between the stomach and the upper portion of the intestinal canal, with exclusion of the duodenum and sometimes a portion of the jejunum. This operation is

performed as a curative or palliative measure in cases of pyloric obstruction when removal of the cause of obstruction is impossible or not advisable. This operation was devised and first practised by Wölfler. Wölfler made an incision about three inches in length in the anterior wall of the stomach, at a safe distance from the carcinoma and near the great curvature, and a similar incision in the convex side of the intestine about thirty ctm. below the plica duodeno-jejunalis, and united these two visceral wounds with sutures, thus establishing a direct communication between the stomach above and the small intestines below the obstruction. In uniting the posterior margins of the wounds the serous or superficial sutures should be first inserted, and tied when the inner or second row are tied, and cut short to the knot. Silk should be used exclusively as suturing material. In Wölfler's operation the current of the intestinal contents is in a direction opposite to the peristaltic action of the stomach, a condition which necessarily must be unfavorable to the easy escape of the stomach contents into the intestinal canal, a circumstance which led Rockwitz to so modify the operation that he turns the intestinal loop one-half around its axis and unites the intestine with the stomach in this position, and thus brings the two organs in such relative position that the peristaltic action of both takes place in the same direction. Von Hacker has modified the operation still further and establishes the communicating opening in the posterior instead of the anterior wall of the stomach. The portion of intestine which should be united with the stomach is a point about twenty-four to thirty inches below the pylorus.

Operators have experienced a great deal of difficulty in finding this place without too great loss of time and unnecessary and harmful handling of the intestines. Luecke gave the advice to seize and unite with the stomach the first intestinal loop that presents itself in the external median incision, and gave it as his opinion and the result of his experience that in doing so the anastomotic

opening will invariably be made near the desirable point, not distant from the duodenum. This advice has led to serious mistakes. In one of the writer's cases, in which this direction was followed, the autopsy revealed the fact that the opening had been made eight feet below the pylorus, and in one of Lauenstein's cases the opening was found near the ileo-cæcal region, consequently nearly the entire length of the small intestines had been excluded from participation in the process of digestion and absorption. In searching for the upper portion of the small intestines it is not always easy, as has been claimed by Hahn and König, to find the plica duodeno-jejunalis, and as the result of quite an extensive experience the writer recommends the following plan: The first loop that presents itself is brought forward into the wound and is held in this position by an assistant, while the surgeon follows the intestine in one direction, observing carefully its color and the thickness of its walls as loop after loop is examined. If the intestine leads in an upward direction the color becomes paler and the walls thicker, and the duodenum will soon be reached. If he is tracing the bowel in an opposite direction the intestine becomes gradually smaller, its walls thinner, and the color more of a bright red hue. Should this be the case the loops of the intestine are returned, and the examination is made from the loop held by the assistant, in an opposite direction, which will soon lead to the part that it is intended to unite with the stomach. As soon as the desired loop is reached it should be twisted around, as advised by Rockwitz, and held in this position by an assistant until the anastomosis has been completed. Of 21 gastro-enterostomies collected by Rockwitz, made for malignant and cicatricial stenosis of the pylorus, the mortality is represented by 57.2 per cent. Billroth reports 28 operations for malignant pyloric stenosis, with 14 deaths. Of those that survived the operation all died in from one to eight months. This great mortality is due to the debilitated condition of the patients operated on, and the great length

of time required in uniting the visceral wounds by suturing. Gastro-enterostomy, as heretofore described and performed, is an operation attended by many difficulties, and requires, even in the hands of an expert, an hour or more for its execution.

As this operation is only done in cases greatly debilitated by disease and long-suffering, anything which will simplify the technique and shorten the time must be looked upon as an improvement. An operation that can be done in ten or fifteen minutes, instead of an hour or two, and which furnishes much better conditions for the healing together of the margins of the visceral wounds, must take the place of the more complicated procedures, which so far have only been practised in the hands of the most experienced surgeons. The author has modified Wölfler's operation by securing opposition between the stomach and the intestine by means of perforated decalcified bone-plates, a method which greatly shortens the operation and brings the parts in a more favorable condition for speedy union. The approximation-plates are reinforced by a number of superficial sutures in the same manner as in establishing an intestinal anastomosis. Scarification of the serous surfaces included by the plates will greatly hasten the formation of firm adhesions and expedite the process of healing by granulation. As the mucous membrane of the stomach always shows a great tendency to evert, it should be fastened in the middle of the wound with a fine catgut suture before the wounds are approximated. A gastro-enterostomy, with the aid of approximation-plates, can be completed in from fifteen minutes to half an hour ; while, if suturing is relied upon exclusively, the time required cannot fall much short of an hour and a half.

The following experiments of the author, taken from the work on " Intestinal Surgery," are well calculated to illustrate some of the advantages attending the use of absorbable approximation-plates over the ordinary methods of suturing in gastro-enterostomy :

Experiment 1.—Dog, weight twenty-five pounds. Incision made through linea alba, from xiphoid cartilage to near umbilicus. Omentum pushed to one side, and the stomach drawn forward into the wound; near the middle of its anterior surface a longitudinal incision was made, two inches in length, and a gutta-percha plate with a central oval opening the size of the pyloric orifice was introduced. Four medium-sized juniper catgut sutures were attached through small perforations around the opening, one at each end and one on each side. The lateral sutures, armed with needles, were passed through the entire thickness of the walls of the stomach, half-way between the angles of the wound. A similar incision was made into the intestine at the junction of the duodenum with the jejunum; the same kind of plate introduced, and the margins of the wound punctured by the lateral armed sutures, when the two wounds were brought *vis-à-vis* and the corresponding sutures tied. In tying the sutures, the lower lateral suture was tied first and the threads cut short; next the sutures corresponding to each angle of the wound were tied, and lastly the upper lateral. The serous surfaces of the stomach and intestine over an area corresponding to the size of the plates were brought into accurate permanent contact by the tying of the sutures. The stomach was replaced and the abdominal wound closed. The animal was allowed to eat immediately after the operation, manifested no signs of illness or pain, and was killed seven days after operation. Abdominal wound healed. Omentum adherent to its inner surface. Union between stomach and bowel firm over the entire surface of approximation. Plates detached, the one in the bowel had passed, while the other was found loose in the stomach. The new opening was large enough to admit the index-finger.

Experiment 2.—Dog, weight fifty pounds. The operation was performed in the same manner as in the previous experiment, but great difficulty was experienced in bringing the stomach forward, as this organ was distend-

ed to its utmost with an enormous quantity of solid food. Evacuation was effected through the incision, aided by attempts of the animal to vomit, the violent contractions of the stomach forcing the food toward the opening, from which it was removed with fingers and spoon. After the stomach was emptied it was washed out with warm water. From the stomach a bone-plate, only partially decalcified, was used, while the approximation-plate in the bowel was fully decalcified. The four approximation sutures were of catgut. Several portions of omentum, which were soiled during the emptying of the stomach, were excised. The abdominal cavity was thoroughly irrigated with warm water before the wound was closed. The animal died the next day, and on opening the abdomen it was ascertained that the immediate cause of death was hemorrhage, as the peritoneal cavity was filled with blood. The bleeding undoubtedly took place from the omentum, by slipping or loosening of one of the catgut ligatures.

Experiment 3. — Medium-sized dog. Operation performed in the same manner with decalcified bone-plates and catgut sutures. The first two days the animal had several attacks of vomiting; it subsequently showed no signs of suffering. Appetite good and stools regular. Killed thirty-four days after operation. Omentum adherent to inner surface of abdominal wound. At point of operation stomach was contracted, so that the organ presented an hour-glass appearance. Interior of the organ contained a large mass of hay and fragments of bone. New opening large enough to pass index-finger. Union between stomach and bowel over entire surface of approximation. Water passed into the stomach flowed through the pyloric orifice and the new opening in a stream of equal size.

Experiment 4.—Large bull-dog. Approximation of anterior surface of stomach with bowel by perforated gutta-percha plates, and four catgut sutures. Length of visceral incisions, two inches. The day after operation

the animal vomited his dinner; subsequently no unfavorable symptoms. Killed fourteen days after operation. Abdominal wound well united. Omentum adherent to wound, duodenum, liver, and at the point of operation. Firm adhesion between stomach and bowel. Water admitted into the stomach only passed through the pyloric orifice. On opening the stomach it was found that the wound in the stomach and intestine had completely healed, the site of incisions being marked by a narrow, firm cicatrix. The failure of obtaining an anastomotic opening between the stomach and intestine could only be attributed to one of two causes, viz.: either the perforations in the plates were too narrow, or the needles of the lateral sutures included too much tissue. Either cause would bring about approximation of the margin of the wounds and permanent closure of the opening by granulation and cicatrization.

Remarks.—All of the animals recovered, except in case of Experiment 2, without any untoward symptoms, although they were allowed to eat immediately after the operation, and the diet was not selected or restricted at any time. In the fatal case death was caused from complications which had no connection with the gastro-intestinal opening. In all of the specimens examined, the mucous membrane of the stomach and intestine which had been interposed between the approximation plates, presented a healthy appearance, showing that the pressure of the plates had exercised no injurious effect on this structure. More recent experience with this operation on animals has revealed the fact that in the stomach a completely decalcified bone plate is almost entirely digested in thirty-six to forty-eight hours. It would therefore appear advisable to use only partially decalcified bone, which remains for a longer time, so that in case of delayed union the approximation would be maintained for a sufficient length of time. As the animals subjected to the operation recovered promptly, and under the most unfavorable conditions, we have every reason to believe

that this operation will be attended by the same favorable results when done for pyloric or duodenal stenosis in man, where a careful preparatory and after treatment cannot fail to facilitate the operation and to improve the conditions for the formation of early adhesions and a speedy definitive healing of the wound. I have no hesitation in recommending it as a substitute for the more time-consuming and less certain operation by the tedious and difficult method of double suturing which is now generally practised.

Gastro-Enterostomy by the Aid of Absorbable Approximation Plates.—*Preparation for Operation.*—The patient must be placed on a restricted diet for a number of days, and during this time the bowels should be evacuated freely by saline cathartics. If the stomach is much dilated it should be evacuated and washed out daily with an aqueous saturated solution of salicylic acid or Thiersch's solution. Irrigation of the stomach immediately before the anæsthetic is administered should never be neglected. The abdomen and anterior surface of the chest should be scrubbed with warm water and potash soap, shaved, and then washed with sulphuric ether or equal parts of turpentine and alcohol for the purpose of removing the fatty material and more effectually disinfecting the glandular appendages of the skin, and the umbilical depression. A compress saturated with a 1 to 2,000 solution of corrosive sublimate is now applied over the field of operation, which is then covered with an impermeable covering, such as gutta-percha tissue or oiled silk, and kept in place by a circular bandage, or a broad, snugly applied binder. If no contra-indications exist, chloroform is preferable to ether as an anæsthetic, as it is less liable to produce vomiting, an occurrence which should be guarded against as far as possible in this operation. If the patient is weak, two ounces of whiskey in a cupful of warm water should be administered per rectum just before the anæsthetic is administered.

Incision.—A straight median incision, extending from the ensiform cartilage to the umbilicus, will afford ample room to bring well forward into the wound the pyloric end of the stomach, and the loop of intestine which is to be united with the anterior surface of the stomach. The fastening of two or more catch-forceps to the parietal peritoneum on each side of the wound will facilitate the remaining steps of the operation. Hemorrhage must be carefully arrested by applying a sufficient number of hæmostatic forceps before the peritoneal cavity is opened.

Decalcified Bone Plates.—The material used for approximation plates should be such as to resist the action of the gastric and intestinal juices, and secure efficient mechanical support for at least three or four days. Plates are much better than rings, because they coaptate and hold in accurate contact larger surfaces of the peritoneum and at the same time act as splints, securing for the parts interposed between them complete rest. After having used many kinds of material for this purpose I settled on using decalcified bone exclusively. This substance will give the desired mechanical support for a sufficient length of time, when it is absorbed or disintegrated and disappears spontaneously, and there is no risk of a foreign body being left in the stomach as an irritant and perhaps later on as a cause of intestinal obstruction. The mishaps in the use of plates that have occurred in my practice have been all in the use of dried plates. I consider the use of all hygroscopic material for the plates as dangerous, as the swelling of the plates may cause extensive pressure necrosis. The plates are now kept in a solution of equal parts of alcohol, glycerine, and water, between two pieces of glass, so as to preserve their smooth surfaces and prevent warping. The fixation sutures should be medium-sized silk, as cat-gut sutures are not sufficiently reliable, the knot is liable to become loosened and slip, and this material, when exposed to the action of the gastric and intestinal juices, does not resist

their destructive action for a sufficient length of time. I must continue to insist that the sutures should be fastened to the plates by the lock or Singer stitch, as if anything should happen to the plate before adhesions have formed the sutures will still continue to hold the parts in apposition. The retention of the lateral or fixation sutures in the margins of the wound for weeks or even months is of no consequence, as I have seen the same repeatedly after circular resection of the intestine without any harm resulting from it. Eventually the threads will work their way through the tissues and escape. The size of the plate, and especially of the oval central opening of the plate, should be sufficiently large to insure a permanent opening in the stomach at least as large as the lumen of the normal pylorus. The perforation in the centre should be at least an inch and three-quarters in length and about half as wide. The margin of the plate around the oval opening should be from one-third to one-half an inch in width. In using plates of this size and with such large openings there is no danger of not obtaining a sufficiently large anastomotic opening which, when once formed and lined with mucous membrane, will not undergo cicatricial contraction.

Approximation of Visceral Wounds.—It has already been stated that the most desirable point for making the opening in the small intestine is about thirty inches below the obstruction. How this part of the bowel can be found most speedily, safely, and with the greatest degree of certainty has already been described. As soon as the abdomen has been opened the great omentum should be pushed aside and the intestinal loop selected brought out at the lower angle of the incision. The direction of the bowel must be ascertained and then the loop brought into the position recommended by Rockwitz and entrusted to a reliable assistant, who should have sole charge of it until it has been united with the stomach.

The intestinal loop is surrounded with a compress of aseptic gauze, when an incision long enough to introduce

the bone-plate edgewise is made in the convex side directly opposite the attachment of the mesentery. After the bone-plate has been properly adjusted the lateral or fixation sutures are passed through the margins of the wound equidistant from the angles and only enough tissue is included to hold the plates in place after the organs have been approximated by tying of the sutures. It is a good plan to direct the needles obliquely, from within outward, and to embrace all of the tissues with the exception of the peritoneum. While the stomach is subjected to the same treatment the intestinal loop is held as before. The opening in the bowel is covered with loose gauze, so as to absorb what little might escape from the interior of the intestine, which, under such circumstances, is usually nearly, if not completely, empty. As the stomach is usually more or less dilated, it can be found without any difficulty. The pyloric portion is brought forward into the wound and is surrounded with a compress of gauze wrung out of warm sterilized water. The opening is made in the anterior wall, near the great curvature, parallel to the long axis of the organ, and at least two inches from the border of the carcinoma. As the mucous membrane always bulges outward and the wound sometimes bleeds freely, both of these conditions are corrected by a few stitches of the continued suture with fine catgut. No force should be used in inserting the bone-plate, the incision should be sufficiently long to permit its easy insertion. After the plate has been properly adjusted and fixed by the lateral sutures and the serous surfaces which it is intended to bring into apposition by the plates are scarified, the two wounds are brought directly opposite each other and the approximation commenced by tying the posterior pair of lateral sutures ; the threads are cut short to the knot. The sutures must be tied only with sufficient firmness to bring the parts into apposition without endangering the circulation. Next the end sutures are tied and lastly the anterior pair of lateral sutures. Before these are tied the

margins of the wound in the stomach and bowel must be carefully pushed between the plates with a director or probe. The knots of the lateral sutures should be buried as deeply as possible, which can be done best with a probe or a pair of small, blunt-pointed scissors. It is advisable to support the action of the plates by a few superficial stitches of fine silk. On the posterior side these stitches should be inserted and tied before the plate sutures are tied. On the anterior surface approximation of the serous surfaces along the margins of the plates can be accomplished most speedily by a few stitches of the continued suture of the same material. After cleansing and drying the parts which have been exposed during the operation the stomach and with it the attached intestine are returned into the abdominal cavity, and the external wound is closed by a row of buried and superficial sutures. The external wound is either sealed with iodoform collodion, or the customary antiseptic hygroscopic compress is applied and held in place by strips of adhesive plaster.

After-treatment.—Stomach feeding must be postponed until quite firm adhesions have formed between the approximated parts, which will require at least two days. During this time the patient's strength is to be supported by rectal alimentation and thirst is quenched with small fragments of ice or sips of hot water. Anodynes should not be given unless the patient is very restless or suffers a great deal of pain. Should painful distention of the abdomen occur about the second or third day a saline laxative should be administered, and if required its action is assisted by a stimulating copious enema. After the first forty-eight hours small quantities of liquid food at short intervals are allowed, and at the end of the first week the patient is placed on a carefully selected diet, which must be continued until the process of repair between the approximated serous surfaces is completed. Patients should not be allowed to leave the bed for at least four weeks, as otherwise a ventral hernia at the site

of incision is very prone to appear as one of the remote consequences of the operation.

Author's Cases of Gastro-enterostomy for Malignant Disease of Pylorus.—The following cases of gastro-enterostomy were made by myself during the last three years. In all of them the indication for the operation was an advanced carcinoma of the pylorus. All of the patients were greatly emaciated, and in two of them the general debility was so great that the operation was not advised, and was performed only at the urgent request of the patients and their friends. The perforated decalcified bone plates were used in all operations in uniting the intestine with the stomach. At first dry plates were used, but after having met with two accidents, caused undoubtedly by the hygroscopic nature of the material, these were abandoned, and since using moist plates, kept in an antiseptic solution, no case of pressure necrosis has occurred.

I have made it a rule that the patient should abstain from taking food by the stomach for at least twenty-four hours prior to the operation, and rely during this time and a few days after the operation entirely upon rectal alimentation. The following description of the operation answers for all the cases.

The evening before the operation the stomach was washed out by the syphon-tube and again just before the anæsthetic was administered. For the last irrigation a five per cent. solution of salicylate of soda or Thiersch's solution was used. In all of these cases the incision was made through the median line and extended from near the ensiform cartilage to the umbilicus. The opening in the stomach was made parallel to the long axis of the organ and at least an inch and a half distant from the margin of the tumor. A continued suture of fine silk catgut was applied around the whole circumference of the opening, both for the purpose of arresting hemorrhage and preventing bulging of the mucous membrane. The opening in the intestine was made first and the plate in-

troduced and sutures adjusted and the loop retained in the lower angle of the wound, covered by a warm compress. The large curvature of the stomach near the pyloric orifice was then drawn sufficiently forward into the wound to make the incision and introduce the plate. When everything was ready for adjustment, the parts around the visceral wound were carefully disinfected, dried, and the serous surface lightly scarified with an ordinary needle over a surface corresponding to the size of the plate; the visceral wounds were then brought opposite each other and a number of fine silk sutures, embracing only the serous and muscular coats, were applied behind the posterior margins of the plates and tied; the middle lower suture was now tied, while an assistant approximated the two openings; the end sutures were next tied, and lastly the anterior middle. The sutures were all cut short and ends buried. During the tying of the sutures it is necessary to exercise caution that the margins of the visceral wound are well embraced by the plates all around. As in these cases the weight of the intestine exerts considerable tension, I have taken the precaution to apply a superficial continuous suture anteriorly after tying the four sutures so as to approximate the serous surfaces over the anterior margins of the plates. The necessary preparations being made, with good assistance the operation can be finished in from twenty to thirty minutes. Usually on the third day small quantities of peptonized milk and beef-tea were given at short intervals and solid diet during the second week.

Case I.—Male, aged sixty-five. Symptoms of pyloric stenosis for one year. Emaciated to a skeleton; œdema of legs; unable to retain food of any kind for more than a few hours. The patient was so anæmic and prostrated that he was only partially anæsthetized. During the operation the pulse became almost imperceptible, and brandy had to be administered subcutaneously, with lowering of head, and hot applications externally. An

hour after the operation the pulse was stronger than before it was commenced. Rectal feeding; only slight rise in temperature on second day; no pain. On the third day small quantities of liquid food by the stomach. The heart's action gradually failed and the patient died of marasmus five days after the operation. The autopsy showed that the plates were still *in situ*, adhesions firm and opening patent. No peritonitis. In this case the carcinoma was circular and limited to the pylorus. Anastomosis just below the duodenum. The intense suffering had made the patient desperate, and although the nature of the disease and the probable outcome of the operation had been fully explained to him, he begged to have it done, with a perfect understanding that at best it would afford only temporary relief. I am quite confident that the operation did not shorten his life.

CASE II.—Male, aged forty-seven. Duration of disease eighteen months; obstinate vomiting; great emaciation and œdema of legs. Contour of tumor could be readily mapped out by percussion and palpation. Tumor adherent to under surface of liver; enlargement of lymphatic glands. In this case the anastomosis was again made just below the duodenum. No untoward symptoms after operation. At the end of the first week solid food was allowed. No vomiting. At the end of the third week an abscess formed in the upper part of the healed incision, in the contents of which the plate ligatures were found. A gastric fistula formed, through which food escaped almost immediately after it was swallowed. This closed in less than two weeks, after which the patient improved in strength and gained in weight. He retained and digested all kinds of food. Improvement continued, so that he was able to walk short distances and to take long drives. At the end of three months after the operation he commenced to fail, and died two weeks later of progressive marasmus. Unfortunately no autopsy could be obtained.

Case III.—Male, aged thirty-five. Symptoms of pyloric stenosis for six months. Tumor discovered four months ago, rapidly increasing in size. Considerable emaciation and cachectic appearance. Tumor involves nearly one-third of anterior wall of stomach and the entire pylorus. Glands of omentum infiltrated. The first loop of intestine which came within reach was united with the anterior wall of stomach in the usual manner. Sutures of abdominal wound removed on the eighth day. Until this time no untoward symptoms, although the patient had taken liquid food for several days. The day following, obstinate vomiting occurred; the plates, very much softened and greatly reduced in size, were ejected. The stomach was repeatedly irrigated, but vomiting continued until the patient died, three weeks after the operation. Autopsy: Abdominal incision united throughout; omentum, stomach, and intestines adherent to abdominal incision. Anastomosis perfect at a point eight feet below pylorus. Intestine between pylorus and artificial opening enormously distended. As the opening was large enough to admit two fingers, it was difficult to understand what had caused the obstruction. The pyloric orifice was large enough to admit the tip of index-finger. Fluid could not be forced from the stomach into the bowel below the new opening. Injection through the duodenum was made with the same negative result. On close examination it was found that the intestine at the point of anastomosis, probably on account of the great length of the part between the stomach and the new opening, had become flexed at the point where it was attached to the stomach, and the two limbs were adherent to each other for four inches. This bending of the bowel had formed a spur, opposite to the opening in the stomach, by the apex of the concave side of the bowel, and this spur acted like a valve, closing the opening in the distal part of the bowel when water was injected into the stomach or duodenum.

This case taught me that it is unsafe to follow the ad-

vice given by Luecke and others, to seize the first presenting loop for the anastomosis, as by so doing it is possible to grasp a loop of intestine which corresponds to the lower portion of the small intestines, as in this case. If this is done, we not only exclude permanently too great a portion of the intestinal canal from the processes of digestion and absorption, but a similarly unfortunate mechanical difficulty at the new opening may be created, as has been described above.

Lauenstein recently reported a case of gastro-enterostomy where the autopsy revealed that the new opening was made near the ileo-cæcal region. In making a gastro-enterostomy it is important, for the reasons just cited, to follow the advice of Hahn or of the author and search for the duodenum, which, when found, can be readily recognized by its short and fixed attachments, and to make the new opening in the upper part of the jejunum as near as possible to the duodenum.

Case IV.—Male, aged forty-three. Has complained of stomach difficulties for a year. During the last two months obstinate vomiting an hour or two after meals. Tumor as large as a child's fist; movable. Emaciation and marked anæmia; glandular infection behind the stomach. Anastomosis made just below the duodenum. Very little pain, and no other symptoms until the tenth day, when he vomited several times. Stomach washed out twice, four hours apart, and food by the stomach discontinued. No vomiting after this, and after two days a liquid diet ordered. At the end of the second week could digest all kinds of solid food, which caused no distress. On the thirteenth day fragments of both plates were found in one of the stools. Patient has gained in flesh, and after four weeks presented a great deal better appearance than before the operation. Patient survived the operation four months, and finally died of marasmus.

Case V.—M. S——, German, laborer, aged thirty-eight, was admitted into Milwaukee Hospital, December

3, 1888. Carcinoma not hereditary in the family. In June last, patient first experienced a distressed feeling in the stomach a few hours after meals, attended by occasional attacks of vomiting, which occurred at intervals of several days and always afforded temporary relief. As the disease progressed the quantity of fluid ejected from the stomach became larger, and always contained fragments of food eaten several days before. The attacks of vomiting became more frequent and gastric digestion more impaired. About two months ago progressive emaciation set in, the patient has lost thirty-five pounds in weight since the beginning of his illness. The pain has been intermittent in character and occasionally quite severe. At the time of admission the patient was greatly emaciated, the skin dry, and of a dark, almost bronze, color. A well defined tumor is readily detected a little below the normal location of the pylorus. This tumor is quite movable and ascends and descends synchronously with the respiratory movements. Irrigation and insufflation indicate that the stomach is greatly distended. A large quantity of partially digested food is removed through the stomach-tube. As the patient's condition was becoming more insufferable from day to day, and the treatment pursued had afforded no relief, he was exceedingly anxious to avail himself of whatever benefit might follow an operation. As his strength had been failing very rapidly for the last two weeks, and as marked anæmia was present, I was fearful that the disease had resulted in almost complete obstruction of the pylorus, and had probably extended to one or more of the surrounding organs. Gastro enterostomy was performed December 16th. Immediately before the operation a subcutaneous injection of one-sixtieth of a grain of atropine was made, and he was given at the same time two ounces of whiskey in warm water per rectum. On opening the abdomen the dilated stomach presented itself at once in the wound. By pushing the organ toward the left side the pyloric portion was made accessible to inspection and palpation. A carci-

noma extending from the pylorus to near the middle of the anterior wall of the stomach was readily mapped out. The disease was much more extensive than I had reason to believe from external examination before the abdomen was opened. Manual exploration revealed what I had suspected—extension of the carcinoma from the posterior surface of the stomach to the head of the pancreas, and numerous carcinomatous lymphatic glands behind the stomach and in the great omentum. As the anterior wall of the stomach was so extensively infiltrated it became necessary to make the incision for the communicating opening with the small intestine nearer the cardiac than the pyloric orifice. The part of the intestine selected was the junction of the duodenum with the jejunum. Duration of operation about thirty minutes.

The patient recovered satisfactorily from the immediate effects of the operation, and although he vomited twice during the evening the pulse and temperature were noted as normal the following day. On the second day a slight tympanites developed, at the same time the patient complained of pain at the site of operation. Rectal injections were relied upon exclusively in stimulating and supporting the patient. Although the temperature remained normal until the morning of the fifth day after the operation, tympanites and pain remained as conspicuous symptoms, and the pulse became more rapid and feeble. The bronzed color of the skin, so marked before the operation, assumed a deeper hue from day to day. On the morning of the fifth day the thermometer registered 97° F. under the tongue, but toward evening the temperature increased to 101° F. The next morning the temperature reached 104° F., and at noon the patient expired. The autopsy revealed a minute perforation at the upper border of the approximation-plates. Dry plates were used in this case, and these had become much softened and thickened, and remained *in situ*. Adhesions between stomach and intestine quite firm. Peritonitis limited to the upper portion of the abdomen. Nearly

half of the stomach on pyloric side involved by the carcinoma. Pyloric obstruction almost complete. Pancreas extensively infiltrated. As only a few auxiliary superficial sutures were used in this case it appears probable to me that during the violent attacks of vomiting, soon after the operation, a limited separation of the approximated viscera occurred, and that the peritonitis, which was the immediate cause of death, was due to this cause.

CASE VI.—A farmer, aged sixty-nine, came under my observation at the Milwaukee Hospital, March 28, 1888. No hereditary predisposition to carcinoma or tuberculosis in his family. He was an industrious man, and in possession of good health until March, 1882, when he had an attack of dyspnœa, which he attributed to fatty degeneration of the heart. A similar attack occurred during the following month, which this time was believed to have been caused by dyspepsia. From this time on he experienced, at different times, weight and a sensation of fulness in the stomach an hour or two after meals. In January, 1889, he first discovered a tumor in the region of the stomach; at the same time digestion became more impaired, so that he could eat and retain only the lightest articles of food. His general health failed rapidly, and before he entered the hospital his body weight was reduced from one hundred and fifty to one hundred and fifteen pounds. For the last ten days stomach-feeding had to be suspended almost completely on account of the pain and distress that followed the eating of small quantities of the blandest kinds of food. Patient is very anæmic, ankles œdematous, pulse 80 to 90 per minute, and very soft and compressible. Tumor in pyloric region about the size of a small orange; movable. After inflation the outline of the large curvature of the stomach could be seen and felt two inches below the umbilicus, while the tumor did not change its relative position to the anterior abdominal wall. Although the patient and friends were fully informed in reference to the probable outcome

of an operation, in view of the enfeebled condition of the patient, gastro-enterostomy was performed at their urgent request, March 31, 1889. Elaborate preparations were made for the operation, for the purpose of preventing collapse. Atropia and whiskey were administered as in the preceding case. The abdomen was opened as usual in the median line, and by retracting the margin of the wound on the right side, the carcinomatous pylorus was brought at once into the wound. The disease had passed beyond the serous coat, and at some points fungous masses could be seen and felt on the surface of the tumor. Adhesions had formed between the growth and the under surface of the liver, and the head of the pancreas appeared to be incorporated in the cancerous mass. The disease involved about four inches of the pyloric end of the stomach. Numerous carcinomatous glands in the great omentum and behind the stomach. An anastomotic opening was established between the stomach, about two inches from the border of the tumor, and near the great curvature and the small intestine, about three feet below the pylorus, by the aid of a large pair of soft plates of decalcified bone. The serous surfaces between the plates were freely scarified, and the action of the plates enforced by superficial interrupted sutures posteriorly, and the continued suture along the anterior border of the plates. Although the operation did not require more than thirty minutes, toward its close the patient's condition became critical—pulse almost imperceptible, profuse clammy perspiration, and pupils widely dilated. Under the influence of stimulants administered subcutaneously and per rectum, and the external application of heat, the pulse improved temporarily, but collapse again appeared, and the patient died two hours after completion of the operation.

Case VII.—German laborer, aged thirty-two, was admitted into Milwaukee Hospital, April 8, 1889. His digestion had always been good until nine months ago,

when he first experienced pain in the region of the stomach, especially an hour or two after a hearty meal. Three months later a swelling was detected to the left of the median line, and a little above the level of the umbilicus. At this time vomiting commenced at intervals of a few days, and the patient states that the ejected material sometimes had the appearance of coffee-grounds. During the last three months emaciation has been alarmingly rapid. At the time of admission a tumor was found about the junction of the left hypochondriac with the epigastric regions, and two inches above the umbilicus. The tumor could be moved from side to side, and ascended and descended synchronously with the respiratory movements. Although the tumor apparently involved the cardiac portion of the stomach, the clinical symptoms pointed to obstructive disease of the pylorus. Its anatomical location was definitely demonstrated by insufflation. During the inflation the tumor changed its position, and when the stomach was well distended it could be distinctly felt and mapped out by percussion at a point a little below the normal situation of the pylorus, while the large curvature of the stomach could be plainly outlined about three inches below the level of the umbilicus. It was evident that the organ had assumed nearly a vertical position, owing to the long standing pyloric obstruction and the great dilatation resulting from it. During the preliminary treatment it became evident that the carcinoma had ulcerated, as on several occasions traces of blood were found in the fluid which returned from the stomach. Gastro-enterostomy was performed by the aid of soft decalcified bone-plates, April 10, 1889. The tumor was found to occupy the pyloric region, and had encroached upon the stomach to the extent of several inches. Although the tumor was very large—the size of an adult's fist—it was freely movable and not adherent to any of the surrounding organs; but the lymphatic glands behind it, and in the great omentum, were extensively infiltrated. On account of the extent of the disease the anastomotic

opening in the stomach had to be made nearer the cardiac than the pyloric end. The part of intestine selected was the jejunum, about twelve inches below its junction with the duodenum. Superficial sutures all around the borders of the plates. No untoward symptoms after the operation. Stomach-feeding was resumed the fourth day after the operation. The intestinal plate, partially disintegrated, but perfect in outline, was passed per rectum on the tenth day. At the end of the first week the patient developed a sharp appetite, ate and digested well a liberal diet, and gained rapidly in strength, and his appearance had undergone a remarkable change. Action of the bowels normal. External wound healed by primary union throughout. In the evening of the fourteenth day after the operation he complained of nausea and a sense of fulness in the stomach, and became suddenly extremely anæmic, and died within a few hours. Although no autopsy was allowed, the symptoms which preceded the sudden fatal termination left but little doubt that death was caused by profuse hemorrhage into the stomach from the ulcerating carcinoma. This view of the case is supported by the fact that soon after the patient complained of nausea percussion revealed an extensive area of absolute dulness over the region of the stomach.

Case VIII.—Brewer's wife, forty-five years old, German, with no history of malignant disease in her family, and previously in good health, had been the subject of serious disturbances of gastric digestion for about a year. During this time she has lost more than fifty pounds in weight. Vomiting appeared about three months ago, at intervals of several days, and always copious. No blood in the material ejected. I made an examination, February 22, 1890, and advised a gastro-enterostomy, as the symptoms then clearly indicated almost complete closure of the pyloric orifice of the stomach. A well-defined tumor was found near the median line, a little above the umbilicus. The tumor could be displaced readily to

either side, but always returned spontaneously to its former location. Irrigation showed that the stomach was greatly dilated, and insufflation demonstrated that the tumor occupied the pyloric extremity. The presence of ulceration was determined by microscopic examination of the contents of the stomach, which revealed numerous blood-corpuscles unchanged by the gastric secretion.

The patient's general health was such at this time that hope could be entertained that she would survive the immediate effects of the operation, and that life might be prolonged by establishing a new outlet from the stomach into the intestine. The operation was declined. The patient returned four weeks later, anxious to submit to any treatment that might offer a chance to check the rapid progress of the disease. Her general condition had undergone a great change for the worse during this time. Gastric digestion had become nearly suspended, to which were added great loss of strength and progressive marasmus. The tumor had materially increased in size, but remained movable; the stomach had become more dilated, vomiting occurred at longer intervals, and the quantity ejected was correspondingly larger. As the patient's only hope was grounded on the expectation of having an operation performed, I yielded unwillingly to her urgent request, and performed gastro-enterostomy, March 22, 1890. Stomach was washed out after the patient was under the influence of the anæsthetic, as she absolutely refused to have it done before. The tumor presented itself at the middle of the median incision as soon as the abdomen was opened. The serous surface was perforated at different points by the carcinoma, and the affected part of the stomach was found adherent to different organs by neoplastic adhesions. On the posterior surface the tumor was firmly connected with the pancreas. A large portion of the latter organ appeared to be involved by the disease, a circumstance which rendered it very difficult to bring the stomach suf-

ficiently forward into the wound for direct operative treatment. As the disease had extended along the great curvature of the stomach farther than along the upper border, the incision was made nearer the small curvature than usual, in order to make the opening at a safe distance from the carcinoma. The intestine was opened near the junction of the jejunum with the duodenum, and the two visceral wounds were approximated in the usual manner by two large decalcified bone plates and a row of superficial sutures. The intestine was united with the stomach in the position advocated by Rockwitz. The plates used in this case were dry, and had been kept in this condition for some time.

Stimulants and food were administered exclusively by rectal enemata.

The operation was not followed by any symptoms of shock, but the patient made repeated attempts at vomiting before she fully recovered from the effects of the anæsthetic.

March 24th, forty hours after the operation, both plates, held together by the four sutures, were ejected during a violent attack of vomiting. Both plates were softened, and at least twice as thick as when they were inserted in the dried state. Although the serous surfaces interposed between the plates were freely scarified before the viscera were approximated and a row of superficial sutures was placed all around the borders of the plates, I was fearful that the adhesions between the stomach and intestine had given way during the violent fit of vomiting which brought up the plates, and that the patient would soon succumb to perforative peritonitis. I was astonished the next day to find the general condition of the patient much improved. She was now allowed liquid food by the stomach, which she retained and digested without any difficulty, and her strength began to improve materially, when, on March 26th, two days after the occurrence of this accident, she was suddenly attacked with typical croupous pneumonia of the lower lobe of the left

lung, which proved fatal April 3d, seven days after the initial chill. The external incision healed by primary union, the bowels responded promptly to mild cathartics, and after the ejection of the plates the symptoms of obstruction were entirely relieved. It is well to mention the fact that at the time the operation was made "la grippe" was epidemic in the city and a number of the patients in the hospital were affected by it.

I am convinced that the increased thickness of the plates, owing to the absorption of fluids from the stomach and intestine, caused pressure gangrene of all the tissues interposed between them, and that perforative peritonitis was only prevented by the superficial sutures which secured adhesions between the stomach and intestine around the area of gangrene. This case taught me an important lesson, and since then I have abandoned the use of hygroscopic material for the plates.

CASE IX.—Male, aged seventy-one, with a good family history, consulted his family physician August 11, 1889. At this time he was well nourished, body weight 160 pounds, complexion florid; pulse, respiration, and temperature normal. Appetite good, but complains of severe pain in the epigastrium and sensation of weakness in the back. After meals has a feeling of fulness in the stomach and eructations of gas. In the absence of positive physical signs his affection was regarded as a chronic gastric catarrh due to pyloric stenosis from unknown cause.

January 15, 1890, the patient was again examined. He has had for some time persistent vomiting three or four hours after meals. If vomiting did not occur for several days, enormous quantities of a brownish, sour fluid, containing undigested fragments of food, were ejected by repeated efforts. Vomiting, preceded and accompanied by sensation of heat and burning in the pharynx. Sleeps well when not disturbed by vomiting. He had lost a great deal in weight; skin, pale, dry, and

scaly; tongue, dry and heavily coated in the middle, edges red and moist. The copious panniculus adiposus had almost completely disappeared. A tumor the size of a child's fist could now be readily detected to the right of the median line and a little below the normal situation of the pylorus. The tumor was movable, and could be displaced to the left of the median line. Irrigation of the stomach revealed enormous dilatation, and insufflation demonstrated that the tumor involved the pyloric extremity. The family were informed of the true nature of the affection, but the patient was told that he had an obstruction at the pyloric orifice which would require an operation in order to obtain the desired relief. The patient was subjected to proper preparatory treatment, after which gastro-enterostomy was performed at the Milwaukee Hospital, January 31, 1890. The disease was found to involve about three inches of the pyloric end of the stomach, and the omental and retro-peritoneal glands were extensively infiltrated. Moist, large, decalcified bone-plates were used. The incision in the stomach was made near the great curvature and about two inches from the margin of the tumor. The upper portion of the small intestine was placed in Rockwitz's position, and after incision was joined to the stomach in the usual manner by approximation-plates and superficial sutures. Although the patient was very anæmic and greatly emaciated, the operation produced no shock or any other untoward symptoms. Stomach-feeding was commenced on the third day, and after the expiration of a week a liberal diet of solid food was allowed. The external incision healed by primary union, and the sutures were removed on the ninth day. The symptoms of obstruction disappeared promptly after the operation, and digestion was fairly well performed. The patient left the hospital, February 13th, in excellent condition, fully confident that the operation had secured for him permanent relief, and that it would add many years to his life. A month later he reported that he had gained eight

pounds in weight, and that he could eat all kinds of food without causing pain or discomfort after eating. He conducted his business for eight or nine months, made many distant journeys, and enjoyed life as well as the average man in perfect health. A ventral hernia developed at the site of the external incision, but did not cause much inconvenience. The patient lived for twenty months after the operation, and finally died of marasmus. During the last few weeks digestion was impaired and symptoms of obstruction again appeared, but were not as distressing as before the operation. There can be but little doubt that at this time the carcinoma reached the new pylorus and partially occluded its lumen. It was evident to all who witnessed the operation that, judging from the general condition of the patient and the extent of the disease, life could not have been prolonged for more than a few weeks without surgical intervention.

Case X.—Farmer, aged thirty-seven, was admitted into the Milwaukee Hospital, December 27, 1890. During the last six years he has suffered repeatedly from attacks of indigestion. For the last two months he has had a severe pain in the stomach, which was always aggravated after meals, and was only partially relieved by vomiting. Vomiting has occurred during the same time regularly whenever solid food was taken. As the vomiting came on several hours after eating, pyloric obstruction was suspected some time ago, but considering the age of the patient it was believed that it was of a non-malignant nature. The patient lost twenty pounds in weight in a few weeks. Examination revealed a hard, irregular tumor to the right of the median line, and half-way between the crest of the ilium and the costal arch. The tumor was not affected by the respiratory movements, and on palpation appeared to be firmly fixed by adhesions to surrounding organs, neither was its location changed by inflation. During inflation a tympanitic area could be

mapped out on the left side of the tumor, extending far below the level of the umbilicus. Inspection and palpation through the median incision revealed a diffuse carcinoma of the pylorus, which had encroached upon the anterior wall of the stomach to the extent of at least four inches, and had extended to the under-surface of the liver and the pancreas. Posteriorly the tumor had evidently reached the retro-peritoneal tissue, as it formed one common mass with the enlarged retro-peritoneal lymphatic glands and pancreas. In the omentum numerous glands, varying in size from a split pea to an almond, were found. Considering the time since symptoms of obstruction first appeared it was evident that in this case the tumor developed very rapidly, and gave rise to early glandular infection and extension to surrounding organs and tissues by contiguity. Through the incision in the stomach digital exploration showed a soft cancerous mass, occluding almost completely the pyloric orifice. Gastro-enterostomy was made by the aid of large, moist, bone plates, with the intestine in Rockwitz's position. Although unnecessary handling of the abdominal organs was carefully avoided, and the operation was completed in less than half an hour, profound shock set in, which, in spite of active stimulation, proved fatal five hours after operation. At the autopsy, the abdominal incision was found agglutinated, and omentum adherent to the wound. Although the stomach was washed out thoroughly just before the anæsthetic was administered, and was found empty when incised, it contained a large quantity of a viscid fluid which was retained probably on account of complete suspension of muscular contraction after the operation, as the anastomotic opening was patent, and fluid could be forced through it in a large stream. Only a very small stream could be forced through the pylorus, showing that its lumen was almost completely obliterated by the ulcerating carcinoma. Approximation of serous surfaces was so perfect that under considerable pressure no leakage could be produced. Nearly half of the pylo-

ric portion of the stomach was infiltrated. The extension of the disease to surrounding organs, ascertained during the operation, was verified by the autopsy. The result of my observations has been that when young persons are the subject of carcinoma of the stomach, the disease pursues a more rapid course and results early in extension to other organs and diffuse infiltration of the retroperitoneal and omental lymphatic glands.

CASE XI.—German, farmer, aged forty-five, was admitted into Milwaukee Hospital, January 21, 1891. Maternal uncle died of carcinoma of the stomach at the age of fifty; patient has always been in robust health until six months ago when at intervals of several days he began to vomit about midnight. A month later a burning pain appeared in epigastrium, radiating toward the right side, which was always relieved by vomiting. The vomiting became more frequent, and the amount of fluid ejected more copious in the course of time. During the last few weeks the simplest articles of food have remained undigested in the stomach, and could be identified in the large quantities of dark viscid fluid thrown up daily by vomiting. Within a few weeks the patient has lost thirty-five pounds in weight. Lavage of the stomach always afforded temporary relief. Patient presents an anæmic and marked cachectic appearance. No tumor can be felt in the pyloric region, either before, during, or after insufflation. Insufflation, however, reveals enormous dilatation of the stomach. The history of the case and the leading symptoms clearly indicated the existence of pyloric stenosis. The general condition and the rapidly increasing stenosis left but little doubt as to the malignant nature of the ob struction. The patient was exceedingly anxious to avail himself at this stage of the doubtful benefits that might be derived by surgical intervention, and at his urgent request gastro-enterostomy was performed the day after he entered the hospital. Large moist plates were used, and the intestine, at a point about thirty inches below the

pylorus was attached to the stomach in Rockwitz's position. No circumscribed tumor was found, but several inches of the pyloric end of the stomach were diffusely infiltrated and the walls much thickened. Diffuse infiltration had also taken place toward the duodenum, even the unaffected portion of the stomach, which was considerably dilated, presented an œdematous appearance; numerous lymphatic glands behind the tumor and in the great omentum, varying in size from a hemp-seed to a large pea. At the close of the operation, which was finished in less than half an hour, symptoms of shock appeared. The patient rallied under the judicious use of stimulants and the external application of dry heat. No untoward symptoms after the patient rallied from the immediate effects of the operation. No vomiting. Bowels moved freely on the second day. On the fourth day stomach-feeding was resumed, and the food administered caused no distress. Sutures were removed on the ninth day, at which time the incision was found healed. The patient appeared to improve for a week, when, in spite of a liberal allowance of easily digestible food, which was retained and digested, his strength gradually failed and he died of simple exhaustion, February 9th, eighteen days after the operation. It is apparent that in this case the operation proved a surgical success, but that it was performed too late to add much to the duration of the patient's life.

Case XII.—Laborer, thirty-five years of age, suffering from advanced carcinoma of the pylorus, came to the Milwaukee Hospital, March 28, 1891, for the purpose of subjecting himself to surgical treatment for pyloric carcinoma. He has always been in good health until about nine months ago, when he began to have a feeling of heaviness and oppression in the stomach a few hours after meals, followed by increasing pain, especially toward evening, which was only partially relieved by vomiting. Vomiting occurred regularly every second or third day. The gastric distress and vomiting gradually in-

creased in intensity and frequency, and he commenced to lose flesh rapidly. At the present time he is unable to retain and digest any solid food, and in consequence of long-continued defective nutrition presents an exceedingly marantic appearance. A round, smooth, movable tumor in the pyloric region was easily detected and recognized as a carcinoma of the pylorus. The short duration of the disease and the great mobility of the tumor made me hopeful that I would be able to make a pylorectomy, and the necessary preparations were made for this operation.

Operation : March 30, 1891. On opening the abdomen the tumor was found free, and limited to organ first affected. Examination of the space behind the tumor revealed numerous enlarged lymphatic glands, a condition which induced me to abandon the intention of removing the carcinomatous pylorus, and to substitute for this operation a gastro-enterostomy. The operation was completed in twenty-five minutes. The upper portion of the small intestine was placed in Rockwitz's position before the anastomosis was made. The patient recovered from the operation without a single untoward symptom, and after the fourth day, when stomach-feeding was commenced, gastric digestion was performed in a satisfactory manner. The external incision healed by primary intention, and the sutures were removed on the ninth day. The patient left the hospital at the end of the second week, and from subsequent information received I learned that he lived three months in comparative comfort, and finally died of marasmus. The anastomotic opening in this case remained patent, and served as an efficient outlet for the chyme, as little or no food could pass through the obstructed carcinomatous pylorus.

Case XIII.—Male, aged forty-four, German, carpenter by occupation; was sent to the Surgical Clinic of Rush Medical College for diagnosis and opinion concerning a chronic affection of the stomach six weeks prior to the operation. He stated that for a number of years he

had been the subject of frequent attacks of indigestion and that he had been unable to eat heavy articles of food without bringing on one of these attacks. During the last year the gastric disturbances have come on at shorter intervals and with greater intensity. Three months ago he first commenced vomiting daily a few hours after the principal meal, and this symptom has recurred at regular intervals ever since. During this time he has lost a great deal of flesh and strength, and even at the time of the first examination he presented a decidedly cachectic appearance. In the region normally occupied by the pylorus, but a little lower down, a hard nodular tumor can be distinctly felt. Irrigation and insufflation of the stomach prove that the organ is greatly distended. During the insufflation the large curvature of the stomach can be outlined distinctly about four inches below the umbilicus; at the same time the tumor is forced a little to the right without changing its relative position to the anterior abdominal wall. The diagnosis made at that time was carcinoma of the pylorus, causing obstruction and dilatation of the stomach. As at this time gastric digestion was nearly suspended, and the patient had already become greatly debilitated from this cause, a gastro-enterostomy was advised.

Nothing was seen or heard of from the patient until five weeks later, when he again made his appearance in the clinic and begged to have the operation performed. In the meantime he had become emaciated to a skeleton. Eyes were sunken in their sockets, cornea lustreless, skin wrinkled and of a dark bronze hue, and ankles œdematous. The tumor had increased in size and the dilatation of the stomach had reached such an extent that the organ was unable to expel its contents by vomiting. The large curvature nearly reached to the pubes. A large quantity of a dark viscid fluid was evacuated from the stomach through an elastic siphon-tube, which afforded temporary relief. The rapid extension of the local disease and the general critical condition of the patient induced

me to advise against an operation, as I was almost convinced that the patient could not survive the immediate effects of the anæsthetic and the shock produced by an operation even of very short duration. The patient would not listen to my objections, and insisted that the operation should be performed, regardless of consequences. I finally yielded to his earnest pleadings, and operated on him before the class, August 21, 1891. For two days prior to the operation the stomach was washed out twice daily, and during this time the patient's strength was supported by rectal alimentation consisting of injections of peptonized milk, beef-tea, and eggs prepared with sodic chloride. A subcutaneous injection of one-sixtieth of a grain of atropia and a rectal enema of two ounces of whiskey in a teacupful of warm water were given in order to guard against shock during and after the operation. Owing to the feebleness of the heart's action ether was used as an anæsthetic in preference to chloroform. The carcinoma extended from the pylorus to the junction of the outer with the middle third of the stomach. The tumor was firmly attached by neoplastic adhesions to the surrounding organs. Omental and retro-peritoneal glands extensively infiltrated. The incision in the stomach was made near the centre of the organ, and with it was united a similar incision of the small intestine near the junction of the jejunum with the duodenum, the intestine being placed in Rockwitz's position before the approximation with large decalcified bone-plates was made. Scarification of the serous surfaces and suturing along the outer border of the plates were done in the same manner as in the preceding cases. The operation occupied less than half an hour, yet near its completion the pulse became very rapid and feeble, the extremities cold, and the pupils widely dilated. In spite of active stimulation by subcutaneous and rectal injections, and the external application of dry heat, the patient did not react from the immediate effects of the operation and died eight hours later.

TABLE OF THIRTEEN GASTRO-ENTEROSTOMIES FOR MALIGNANT PYLORIC OBSTRUCTIONS.

Case.	Sex.	Age.	Duration of Disease.	Result.	Remarks.
1	Male.	67	1 year.	Recovered.	Died five days after operation, of exhaustion.
2	"	47	18 months.	"	Improved for several weeks; died of marasmus three months after operation.
3	"	35	6 "	Died.	Immediate cause of death, intestinal obstruction at site of operation; death three weeks after operation.
4	"	43	1 year.	Recovered.	Improved for several weeks; died of marasmus four months after operation.
5	"	38	6 months.	Died.	Immediate cause of death, perforative peritonitis.
6	"	69	1 year.	"	Cause of death, shock, two hours after operation.
7	"	32	9 months.	Recovered.	Death from hemorrhage into the stomach, from ulcerating carcinoma, nine days after operation.
8	Female.	45	1 year.	"	Died twelve days after operation, from croupous pneumonia.
9	Male.	71	16 months.	"	Improved for several months, and died of marasmus twenty months after operation.
10	"	37	4 "	Died.	Cause of death, shock, five hours after operation.
11	"	45	6 "	Recovered.	Died eighteen days after operation; immediate cause of death, marasmus.
12	"	35	9 "	"	Improved for several weeks, and died of marasmus three months after operation.
13	"	44	1 year.	Died.	Died eight hours after operation; immediate cause of death, shock.

Remarks.—Adding the 2 pyloro-plastic operations to the 13 gastro-enterostomies we have 15 operations on the stomach for malignant and non-malignant stenosis of the pylorus, of which number 10 recovered and 5 died, a mortality of 33.3 per cent. Of the 13 operations for carcinomatous pyloric obstruction on as many patients 12 were males and 1 female. The youngest patient was thirty-two years of age, the oldest seventy-one; average

age, forty-six years and ten months. The duration of the disease could only be ascertained approximately, eighteen months being the longest and four months the shortest period intervening between the first manifestation of symptoms and the time of operation; average duration, ten months and ten days. In most of the cases vague symptoms of gastric derangement preceded the actual development of symptoms pointing to pyloric obstruction for several years, months, or weeks. In all of the cases the existence of pyloric obstruction at the time of operation was evident from the complexus of symptoms present at the time, the results of physical examination, and, in most instances, verified by digital exploration of the pylorus during the operation. In only one case did I fail in detecting enlarged lymphatic glands in the vicinity of the carcinoma, and that was the first case reported, in which I found an annular malignant stricture without involvement of the serous coat and adjacent lymphatic glands. This would have been a proper case for pylorectomy had the patient's general condition warranted such an operation. In all of the remaining cases the carcinoma was more extensive, and the lymphatic glands in its vicinity infiltrated, and in many of the cases the growth was connected with one or more of the surrounding organs by neoplastic adhesions. In all of these cases the local conditions were of such a nature that a radical operation by pylorectomy was out of the question, irrespective of the general condition of the patients. Analysis of the immediate and remote results of the thirteen cases of gastro-enterostomy shows the following: Eight of the patients survived the immediate effects of the operation and five died. Among the recoveries are included all cases in which the immediate cause of death could not be attributed to the operation. In Case I. death occurred five days after operation, from exhaustion. Nothing occurred that would tend to show that the operation shortened life. The patient was extremely anæmic and emaciated at the time of operation, but he rallied from its immediate effects promptly; the

symptoms of obstruction were relieved but he gradually sank, and died five days later from simple exhaustion, due to the disease and its secondary consequences, and not to the operation. In two other cases reported as recoveries death occurred in one, twelve days after operation, from croupous pneumonia, in the other, on the ninth day, from hemorrhage into the stomach from the ulcerating carcinoma; in both instances the external incision had healed, the symptoms of obstruction were removed, and gastric digestion was partially restored. The remaining five cases that recovered lived, respectively, one, eighteen days; two, three months; one, four months; and one, twenty months after the operation, and finally died of marasmus. The most remarkable of these was Case IX., the oldest patient on the list, who had been suffering from pyloric carcinoma for sixteen months, and who at the time of operation certainly could not have lived for more than a few weeks without surgical intervention. This patient recovered without a single untoward symptom, lost the cachectic appearance, gained a number of pounds in weight, resumed and conducted his business for eight months, and died of marasmus twenty months after operation. Billroth makes the statement that in none of his cases of gastro-enterostomy for malignant pyloric obstruction was life prolonged for more than a year after the operation. Two of my patients lived three, and one four months after operation, and in none of them did symptoms of pyloric obstruction appear after the operation. In Case III. an autopsy was made. The dilatation of the stomach had disappeared, the anastomotic opening was large enough to admit the tips of two fingers, and was lined throughout by mucous membrane. In the five fatal cases death occurred in from two hours to three weeks after operation. In three of these the patients succumbed to the immediate effects of the operation in two, five, and eight hours. One died of perforative peritonitis on the fifth day, and in one death was caused by intestinal ob-

struction three weeks after operation. In the last case the intestine was attached to the stomach at a point eight feet below the pylorus. At a point nearly in the centre of the opening in the bowel a sharp flexion was found at the autopsy, and in consequence of this flexion the mesenteric portion of the bowel formed a spur, which directed the contents of the stomach into the portion of bowel on the proximal side of the anastomotic opening. In view of the extent of the local disease, the gravity of the secondary lesions due to long-standing pyloric obstruction, and the serious impairment of the general health present in all the cases, the immediate and remote results as given above must be regarded as satisfactory.

The important lesson to be drawn from these cases is not to postpone operative treatment for pyloric obstruction until the patient's strength is so much reduced that death would be likely to ensue from the immediate effects of an operation of even very short duration. In a number of the cases reported above, an operation was advised in time, but was refused until the patient had become convinced by sad experience that it offered the only chance of relief; but in the meantime the local and general conditions had become so much aggravated that the prospects of success were reduced to a minimum. More than one of the patients, when he had reached this desperate condition, threatened to put an end to his sufferings by suicide in case an operation was refused, and this determination more than once turned the scales when I hesitated to carry into effect their request. Patients suffering from pyloric stenosis must be informed in time of the inefficacy of all methods of treatment short of removal or rendering harmless the obstruction by operative treatment. The results of gastro-enterostomy for malignant stenosis of the pylorus will improve and become more satisfactory as soon as the profession will sanction early surgical interference and patients can be made to submit to it as soon as a positive diagnosis can be made.

In conclusion I beg to submit the following propositions for your further consideration and discussion :

1. Pyloroplasty, as devised by Heineke-Mikulicz, is the safest and most efficient operation for cicatricial stenosis of the pylorus.

2. Pylorectomy in the treatment of carcinoma of the pylorus is a justifiable procedure when the disease is limited to the organ primarily effected and the patient's general condition furnishes no contra-indication.

3. Gastro-enterostomy by the aid of large, moist, perforated plates of decalcified bone should be resorted to in the treatment of malignant stenosis of the pylorus as soon as a positive diagnosis can be made, and a radical operation is contra-indicated by local or general conditions of the patient.

532 Dearborn Avenue.