

the symptom pain has undergone decided exacerbations and remissions despite the persistence of the fatty tumors. These cases, it seems to me, are to be differentiated from those which I have reported, or those dependent upon obesity, in which a disappearance of the localized fatty tumors is accompanied by a permanent subsidence of all pain (when present), usually moderate in degree.

It may be questioned whether the results reported in these cases may be properly classed as cures. The concurrent recurrence of the localized fatty tumors and general obesity in Case II and their complete disappearance for a second time indicate that a cure is possible in all cases in which the probable cause (polysarcia) is amenable to hygienic and regiminal measures. In Dercum's disease the usual results of efforts at treatment are diametrically opposed to those obtained in my cases.

THE CHOICE OF OPERATION IN PYLORIC STENOSIS.¹

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PYLORIC obstruction, whether of benign or malignant origin, is one of the most important problems in gastric surgery. I was influenced in choosing this subject for my paper: (1) By the fact of its very general interest to the profession at large; and (2) because the whole field of gastric surgery is manifestly too large to be satisfactorily covered in the limited time at my disposal. Indeed, it has many phases, the consideration of which could very profitably occupy more than the whole of my allotted time. For the sake of brevity, I shall still further limit myself to a consideration of strictures of the pyloric orifice of an organic nature, leaving entirely out of account the interesting but indefinite group of functional and spasmodic affections.

By common consent, and from its essential mechanism, the management of pyloric stenosis is placed beyond the border line of medicine, within the domain of surgery; and rightly so, since it is clearly a surgical problem, pure and simple. Even the most ardent advocate of medical treatment will hardly claim more than temporary benefit from therapeutic measures alone. Medicine cannot solve a problem in mechanics. For permanent relief from his malady the patient must turn to the surgeon. The sooner this fact becomes firmly established in the medical mind, and is allowed to control its action, the sooner will one of the chief causes of that standing reproach to the medical profession, the "chronic dyspeptic," be removed.

¹ Read at a meeting of the Virginia State Medical Society, November 14, 1907.

In seeking relief from a given condition, a consideration of the causes giving rise to it, will often prove of great advantage. Pyloric obstruction in the adult, whatever its nature, has its origin, in the vast majority of cases, in an active or healed ulcer. Pyloric stenosis occurring in infancy is a separate and distinct entity, and will be referred to later. For the certain knowledge of the important part played by gastric ulcer in the etiology of gastric cancer, the medical profession is indebted primarily to the surgeon. In this connection, reference should be made to the notable contributions of Rydygier,² Rodman,³ and more especially the Mayos.⁴ More recently these observations have been abundantly confirmed by a wider experience and by other surgeons.

A study of the conditions associated with the production and further continuance of gastric ulcer ought to prove instructive in this connection, since it plays such an important part in the etiology of pyloric obstruction. Then, too, a knowledge of the phenomena presented in the life history of a gastric ulcer will help to explain certain symptoms frequently observed in the course of pyloric obstruction which might otherwise be obscure and difficult of correct interpretation. In this way the diagnosis of pyloric stenosis, whether benign or malignant, not by any means always easy although usually possible, is rendered more simple. But all this, however pertinent and and helpful it might be, would lead us too far afield. Suffice it to say that a clear conception of the close relationship existing between these two conditions, namely, ulcer and cancer, will aid materially in the proper understanding of its pathology, diagnosis, and treatment.

A diagnosis, then, of pyloric obstruction having been made, and the condition being admittedly a surgical one, and amenable to surgical treatment only, the surgeon's chief concern at once becomes the choice of operation. In making this choice, he should be influenced not alone by one, but by many considerations. In the first place, the personal equation of the operator, and the patient as well, should not be disregarded. Some particular form of operation, through greater familiarity and experience with it, or for technical or other reasons, he may be able the better to perform than some others. A surgeon may begin an operation with his plans all laid and his mind made up to follow a certain definite line of action, to perform a posterior gastro-enterostomy, for instance, when after the abdomen has been opened, he is confronted by unexpected conditions, which, if he has the best good of his patient at heart, may compel him to change entirely his method of procedure. This sounds elemental in a company such as this, and it is, but I fancy that every operator has experienced the temptation to carry out preconceived plans in spite of opposing conditions. One should always begin every opera-

² *Centralbl. f. Chir.*, 1906, Beilage Nr. 28.

³ *Trans. Amer. Surg. Assoc.*, 1900, xviii, 38.

⁴ *Annals of Surgery*, 1904, xxxix, 321; 1905, xlii, 641; 1905, xliii, 537.

tion, particularly upon the abdominal viscera, with an open mind prepared to do that which is indicated by the pathological condition found to be present.

The condition of the patient should always be one of the first considerations in determining upon a given course. Operative procedures, involving undue manipulation or great length of time, may be absolutely contra-indicated in a weak or debilitated patient. It is well to bear in mind that the least one can do that is at all effective, is often the best that one can do. In no class of cases is this more true than in those unfortunates suffering from advanced cancer of the stomach with marked obstructive symptoms. Here a rapidly performed anterior gastro-enterostomy done, perhaps (in order to further shorten the time of operation), with the aid of a Murphy button, always a doubtful procedure, may become the operation of choice.

After the general considerations, some of which I have indicated, come the special ones, and in a patient in otherwise good condition they will most likely determine the choice of operation.

In the case of pyloric obstruction, the result of early cancer, the attempt at extirpation should always be made. In other words, pylorectomy is here the operation of choice. The mortality is but little, if any, greater than in the palliative operation of gastro-enterostomy, while the relief of pain and other disagreeable symptoms is more sure, and the average length of life appreciably greater. In those unfortunate cases in which by reason of adhesion to and invasion of surrounding structures the cancer has progressed beyond the point of extirpation, a gastro-enterostomy is the only thing that offers even temporary relief, and should be done as a last resort. This operation performed under these most unfavorable conditions shows a very high mortality rate, anywhere from 15 to 50 per cent., depending upon the operator. The average prolongation of life is not more than three to six months, and the fact that a patient occasionally lives beyond this time suggests the possibility that with a more radical procedure he might have lived even longer (Murphy).

The operation of pylorectomy has been placed upon a very firm pathological basis by the classical work of Billroth, Kocher, Mikulicz, Hartmann, Mayo, and others. The later reports from the different clinics show a very low rate of mortality, that from the Mayo Clinic, 9.5 per cent., being the most satisfactory. The technique as given by Mayo is perhaps the simplest. I will not take up your time with a description of it, but refer you to his paper. This operation can be performed by the average operator in from one to one and one-half hours. The anastomosis is effected by the Billroth "No. 2" method, that is, the complete closure of both duodenal and gastric stumps with an independent posterior gastrojejunostomy. This is the operation of choice, both on account of the ease of accomplishment and safety. Personally, I have had great satisfaction with this operation

in the limited number of cases in which I have performed it—eight times without a death.

Great difficulty is sometimes experienced, after the abdomen has been opened, in distinguishing between an early carcinoma and the indurated and hypertrophied gastric wall about a chronic ulcer. Indeed, at times it is absolutely impossible to make a diagnosis from gross appearances alone, even after the specimen has been removed. In conjunction with Dr. Julius Friedenwald I reported such a case at the last annual meeting of the American Gastro-enterological Association in Atlantic City. Similar cases have been reported recently by Bloodgood and Lund. In the case just referred to the clinical diagnosis was ulcer. At the operation on account of the indurated tumor and the infiltration of the stomach wall and the fat along the lesser curvature, the diagnosis of cancer was made. In the laboratory, on gross inspection, it was at first supposed to be cancer; but later microscopic examination of sections revealed nothing but inflammatory tissue. In another case upon which I operated some years ago in which clinically almost identical conditions prevailed, a very early cancer was discovered only after careful microscopic examination of sections through the base of the ulcer. The lesson to be learned from these observations tends to confirm Rodman's contention that, in case of doubt, especially in persons past middle life, and in ulcers that have run a chronic course, or in which there is much cicatricial tissue present, pylorectomy, from the standpoint of prophylaxis as well as cure, is the operation of choice.

Heretofore, we have been dealing with the actual existence of carcinoma, or with conditions in which its presence may be reasonably suspected. In the cases of benign obstruction, however, it will be found for one reason or another that the choice of operation will eventually lie between gastro-enterostomy and some other surgical procedure, pylorectomy, pyloroplasty, gastro-duodenostomy, etc. I have already discussed the conditions under which pylorectomy should be given the preference. It now remains to consider the circumstances which should influence one in making a choice between the other operative procedures. Many arguments have been advanced, based upon physiological and other grounds, theoretical and practical, both for and against the operation of gastro-enterostomy; but at present it is, with the majority of surgeons, the operation of choice. Undoubtedly upon strictly physiological grounds, the advocates of pyloroplasty and gastroduodenostomy have the better of the argument. The clinical fact remains, however, that whatever the outcome under other circumstances, in the majority of cases of pyloric stenosis, properly selected and properly done, the operation of gastro-enterostomy is followed by satisfactory results. This fact influences greatly, and rightly so, the course of action of most surgeons in determining upon the particular operation to be performed.

The various arguments for and against these two procedures have been from time to time brought out by different writers, notably the excellent article of Cannon and Blake.⁵ More recently, the studies in the physiology of altered digestion and the metabolism of fats, following these operations made by Katzenstein, Joslin, Murphy, Patterson, Leggett and Maury,⁶ and others are of interest and value. In this connection Paterson's⁷ conclusions are worth quoting in full as embodying the latest ideas upon the physiological effects of gastro-jejunosomy: "(1) A certain amount of bile and pancreatic juice enters the stomach after gastro-jejunosomy, but the amount is small and has no injurious effect. (2) The acidity of the gastric contents is markedly diminished, usually about 30 or 35 per cent. This is due partly to a diminution of the total chlorides secreted, and partly to the partial or complete neutralization of the free hydrochloric acid by the alkaline bile and pancreatic juice, and probably also to earlier stimulation of the pancreatic secretion, and compensatory earlier fall of the gastric secretion. In gastric ulcer cases the removal of spasmodic stenosis of the pylorus, likewise tends to diminish the total acidity. (3) Gastric digestion is impaired but not lost after gastro-jejunosomy. (4) The motility of the stomach, if normal before operation, is for practical purposes unaffected. Gastrojejunosomy is, therefore, not a drainage operation. Its beneficial effects on gastric ulcer are due to the diminution of the acidity of the gastric contents. (5) Gastrojejunosomy has no material effect upon the metabolism of the human body, the percentage of nitrogen and fat absorbed being within the limits observed in individuals who are apparently healthy. This chemiopathologic evidence is supported by evidence of clinical experience."

Further observations along these lines after long periods of time will have to be awaited before any very definite conclusions are warranted.

As indicated above, gastro-enterostomy is the operation of choice on the part of most surgeons, and its field of usefulness is being constantly widened. This is true largely because the technique of the operation has been greatly simplified. The composite "no-loop" operation described by W. J. Mayo in 1906 is a fairly simple operation, and can be readily performed by surgeons without any special training in abdominal surgery. The results of this operation have been on the whole satisfactory, especially in the larger clinics, where the mortality has become merely nominal—a fraction of 1 per cent.—and the functional results, according to the published reports, excellent. It must be observed, however, that this operation is one which, in order to obtain the best results, requires upon the part of the operator a considerable amount of skill and experience in its performance.

⁵ *Annals of Surgery*, 1905, xli, 686.

⁶ *Ibid.*, 1907, xlvii, 549.

⁷ *Trans. Section on Surg. and Anat., Amer. Med. Assoc.*, 1907, p. 80.

According to the published reports, the results of the occasional operator are found to be not nearly so satisfactory as those obtained in the hands of the more skilled and experienced surgeon. This is a point of considerable importance, and one that has not been sufficiently emphasized. The same is true, to a certain extent, of the operation of pyloroplasty or gastroduodenostomy, but here, owing to the different mechanism and less complicated technique, the results in the hands of different operators are likely to be more constant. Unfortunately, in the case of neither operation have the end results been observed long enough, or have they been studied with sufficient care and detail, to enable one to state accurately the relative advantages and disadvantages of the two methods. Both have their good points. Each has its objections.

From a purely physiological standpoint it seems that the advocates of the pyloric operation have the advantage, but unquestionably the clinical results obtained after gastro-enterostomy in the presence of obstruction are better than the physiologists would have us believe. In discussing the relative advantages and disadvantages of the pyloric operations and those in which the stoma is placed at some distance from the pylorus along the greater curvature of the stomach, I shall consider the "no-loop" operation of Mayo as the best type of the gastro-enterostomy operation, and the plastic operation on the pylorus described by me in 1903, as the most satisfactory type of the pyloric operation.⁸ The advantages of the Mayo operation over all other forms of gastro-enterostomy except as indicated above, in which a hurried operation for advanced cancer is to be performed, are so obvious as to need no further discussion.

One must not forget that gastro-enterostomy performed in the presence of an obstructed pylorus is a much more satisfactory procedure than when the pylorus is unobstructed. Hence, better results are to be expected from the operation done under the conditions with which we are dealing in this paper than under other circumstances.

The chief idea in placing the stoma at the most dependent portion of the stomach, is to bring about better drainage, by calling in the aid of gravity. This assumes that the stomach is a relatively passive bag. But as pointed out by Cannon and Blake, this is not the case. The stomach is at no time during digestion in the condition of a passive reservoir, but vigorous peristaltic waves continue to pass over the pyloric half of the stomach, from within a few minutes after food is ingested, until it has entirely emptied itself. It would appear from the experiments of these observers carried out upon cats, and those of other experimenters upon dogs, that as long as there is even the slightest opening through the pylorus, a certain amount, at least, of food will continue to pass through it. It will be objected by some that it is a far cry from the stomach of a healthy cat or dog to that of

⁸ Johns Hopkins Hospital Bulletin, 1902, xiii, 155.

a diseased human being; but the underlying physiological principle is the same, and the question of drainage of the stomach through the newly formed stoma, or the production of physiological rest of an ulcerated or contracted pylorus through the same means, must remain for the present in doubt.

Among the specific objections that have been urged against gastro-enterostomy are the development of peptic ulcer of the jejunum. Some 33 cases, many of them fatal, of this interesting condition have been reported in the literature up to the present time. The affection seems to be much more rare in this country than abroad, but a single case having been reported here in the human being. Watts has observed it once in a dog. The exhaustive monograph of Gosset, published in 1906, brings the subject up to date, and shows that it occurs much more frequently in males than in females; and that it occurs with slightly greater frequency following anterior operations than posterior. No case, so far as I can find, has been reported after the "no-loop" operation, nor has it followed operation for cancer. The causes of this interesting affection are not definitely known, but its relation to marked hyperacidity seems to be pretty constant. As pointed out by Robson, many more cases have probably occurred, but have passed unrecognized because they were non-perforating or obscured by other complications.

The development of spur-formation, the formation of kinks of the intestine, and the presence of the vicious circle, so common in the older loop operations, are now by the later and more improved methods happily rarely met with, but when they do occur they are of the greatest gravity, and in their management tax the resources of the surgeon to the utmost.

The advantages of pyloroplasty are obvious, preserving, as it does, the natural anatomical and physiological outlet. A year ago I reported a three years' experience with this operation, covering a list of 33 cases.^{*} During the past year I have operated upon 12 additional cases, making 45 in all. In this series of cases I have endeavored, as far as possible, to test the method in all classes of benign stenosis of the pylorus and its attending complications. In this list are included examples of practically every condition with which one is likely to meet, namely, dilatation of the stomach, dense adhesions, hypertrophy and cicatricial thickening of the stomach wall, acute and chronic ulceration, hemorrhage, pylorospasm, etc. The results thus far obtained have been most satisfactory. I have found no case in which the operation was contra-indicated, or could not be performed. The objections urged against it, namely, difficulty of performance in the presence of adhesions and dense cicatricial tissue about the pylorus, are, in my experience, more fanciful than

^{*} Surg., Gyn., and Obs., 1906, vol. ii, p. 163.

real. I have performed the operation many times in the presence of adhesions and cicatricial tissue of the densest character. The ease with which it can be performed depends largely upon what Koeber¹⁰ has called "mobilization of the duodenum." This procedure was first suggested and insisted upon in my original paper, and if the duodenum is sufficiently freed to allow of its being brought easily into apposition with the stomach wall, as is possible in practically all cases, the difficulties of the operation will be largely done away with.

This operation has the additional advantage that it renders possible the excision, when it is deemed advisable, of an ulcer, active or bleeding, or cicatricial tissue, from the anterior gastric or duodenal wall. I have on several occasions been able to do this. It is perfectly possible to provide a pylorus of ample diameter. One should, however, not make the opening too large, as it might give rise subsequently to disagreeable regurgitation of bile, which has been observed by Mayo. One of the most satisfactory features of the operation is the almost entire absence of postoperative nausea and vomiting. Just why this should be so I do not know, unless it has to do with the division of the pylorus, and the doing away with pylorospasm. In the majority of cases relief has been immediate and marked, but Muoro¹¹ has found that it came a little later in his cases than it did after the operation of gastrojejunostomy. The mortality rate is about the same, perhaps a little better, than that of gastro-enterostomy. Dr. Julius Friedenwald has kindly studied the digestive changes present in a number of my cases, both before and after operation. His reports show uniform restoration to a practically normal condition of the stomach, both as to size, function, and motility.

The technique of the operation as originally reported by me has been modified by Gould,¹² and the majority of operators who use it at all prefer this modification, making use of intestinal clamps. I still prefer the original method and the interrupted mattress suture of Halsted, believing the clamps to be unnecessary, and for the anterior wall, at least, the interrupted to be safer than the continuous suture, particularly in the presence of dense cicatricial tissue. I would, therefore, in all cases of benign stricture of the pylorus give the preference to pyloroplasty as against gastro-enterostomy, believing that it better than any other method fulfils the conditions to be met.

Stenosis of the pylorus in infancy, as indicated at the beginning of this paper, is a distinct pathological entity and should be considered by itself. Scudder,¹³ in a recent monograph, has collected 155 cases

¹⁰ *Zeitsch. f. Chir.*, January 10, 1903, Nr. 2, p. 33.

¹¹ *Annals of Surgery*, 1907, xlv, 818.

¹² *Operations upon the Stomach and Intestines*, 1906, p. 225.

¹³ *Boston Med. and Surg. Jour.*, 1907, clvii, 321.

reported in the literature. There is uniformly found a tumefaction occupying the position of the normal pylorus. This consists of a hyperplasia of the circular, muscular fibers of the pyloric segment. Various theories of the etiology have been advanced, all interesting but unsatisfactory.

As to the choice of operation for this very interesting pathological condition, Scudder has this to say: "Pyloroplasty and gastroduodenostomy, whether of the Kocher or Finney type, are theoretically and physiologically ideal procedures. Posterior gastro-enterostomy is proved to be physiologically satisfactory, and in these cases of infantile stenosis is certainly anatomically the choice of all procedures." Whether the obstructed pylorus recovers itself after the gastro-enterostomy and functionates naturally after a time, is as yet undetermined, because there are no records of autopsy findings long after operation. Meanwhile owing to the peculiar pathological conditions present and the difficulty of manipulation on account of the small size of the structures dealt with, gastro-enterostomy should probably be given the preference.

Personally, I am wedded to the operation of pyloroplasty because I do it better than any other, and now perform it altogether, except in case of malignant disease. I have been led to this position by the fact that my results have been so much more satisfactory with this operation than with any method of gastro-enterostomy that I have employed. I have found it easier of execution and requiring less time in its performance than gastro-enterostomy. It is only fair to add, however, that my results after Mayo's "no-loop" operation in cases of gastric cancer have been most gratifying. In the final decision, then, as between these two methods of procedure, since both are attended by an equally low rate of mortality and both give clinically excellent results, the individual operator should be guided for the present in his choice of operation by his own personal equation. Having at all times, first and foremost, the good of his patient at heart, he should choose that particular method which has been followed by the best results in his own hands, being zealous at all times to perfect himself in those methods having a sound physiological and pathological basis.