

AN ANALYSIS OF THE VAGOTOMY CONTROVERSY*

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IN MANY of the articles on vagotomy the authors have implied that in the past vagotomy has been tried and abandoned. Although vagotomy and gastro-enterostomy were performed by Latarjet in 1922, neither the indications for the operation nor its technic were the same as today.⁶ In the earlier cases vagotomy was performed for tabetic crisis, for gastric ulcer and for "gastropathies without macroscopic lesions," and there is no reference to the employment of vagotomy in any series of cases of duodenal ulcer until Dragstedt began his clinical studies in 1943. Moreover, the descriptions of the technic employed in the first part of the century make it clear that the denervation was done low on the stomach and that it was incomplete.

Although Berg and others employed unilateral vagotomy in conjunction with gastric resection, full credit must be given to Dragstedt not only for establishing a sound physiologic background for vagotomy in both clinic and laboratory, but also for recognizing that vagotomy alone is accompanied by such a high incidence of gastric retention that a complemental gastro-enterostomy is desirable.

Many of the early studies on vagotomy, such as those of Francis Moore,⁷ were made on patients subjected to transthoracic vagotomy without gastro-enterostomy, but since Dragstedt and others who have had considerable experience with transthoracic

vagotomy have abandoned it in favor of vagotomy with gastro-enterostomy, the early studies on vagotomy alone are of historic interest only.

Because some patients after vagotomy have normal gastric acidity, it has been assumed by some⁹ that the effect of vagotomy in controlling the hypersecretion of acid in patients with duodenal ulcer is either slight or transitory. But it has not always been realized that if the abnormal hypersecretion which is present in patients with duodenal ulcer is abolished, the ulcer will heal even if the secretion of acid is still within the limits of normal. Moreover, Stein and Meyers' studies of gastric secretion⁸ indicate that a complete vagotomy controls the excessive secretion of acid in patients with duodenal ulcer for as long as four years after operation, and that striking decreases in secretion are maintained for the same length of time even after incomplete vagotomies.

In the early days of vagotomy, considerable confusion arose because the basic differences between gastric and duodenal ulcer were not appreciated and too often the results obtained in both types of ulcer were reported together. Despite the better separation of cases in more recent articles, differences in the reported results persist, and the reasons for these differences are worthy of examination.

The preliminary report of the survey made by the Subcommittee of the American Gastro-enterological Association is incomplete, difficult to evaluate, and contains

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some apparent paradoxes.⁴ For example, in this report there was a higher percentage of patients expressing satisfaction with the results of vagotomy with gastro-enterostomy than with gastric resection, yet the Committee concluded that "subtotal gastric resection alone—has produced better results in the control of ulcer disease than gastro-enterostomy plus vagotomy." It is also paradoxical that although 94 per cent of one group of patients having vagotomy with gastro-enterostomy expressed satisfaction with the results of operation, yet 29.3 per cent are reported to have persistence of ulcer symptoms. It is difficult to see how a patient can continue to have symptoms of ulcer and yet be satisfied with the results of an operation for ulcer, and it immediately raises the question of what criteria were used for determining the presence or absence of ulcer symptoms. Since the data were accumulated by residents at the hospitals in which the operations were performed, and since many of the criteria of success or failure depended on such notoriously equivocal factors as evidence of marginal ulcer by roentgen ray, it is obvious that the factor of personal interpretation of results must have played a large role in the conclusions drawn from the study.

Another factor that can influence the postoperative results is the type of case selected for operation. Since many surgeons employ vagotomy with gastro-enterostomy selectively in certain types of duodenal ulcer and employ gastric resection in other types, the results obtained in these selected cases do not necessarily measure the true efficacy of either operation. For example, Walters states that vagotomy with gastro-enterostomy is indicated in cases in which the ulcers are "small." This group must include patients whose symptoms are out of proportion to the objective evidence of ulcer found at operation, and would probably include patients whose complaints are functional in origin and could not be ex-

pected to be benefited by operation. An evaluation of the results of vagotomy with gastro-enterostomy in such a group of cases in which there was minimum evidence of organic disease would not reflect the true value of the operation any more than the true value of cholecystectomy could be determined from analysis of a series of cases in which there were no gallstones. In this same connection some of the low mortality rates reported for gastric resection must be accepted with the understanding that they too represent the results obtained in a selected group of patients and do not represent the mortality to be expected in a large consecutive group in which all patients were treated by gastric resection regardless of technical difficulties.

Statistics assembled by Walters in recent publications suggest that gastro-enterostomy alone is as effective as gastro-enterostomy combined with vagotomy in the relief of the symptoms of duodenal ulcer.¹⁰ Yet he also states that 86 per cent to 88 per cent of the patients with jejunal ulcer occurring after gastro-enterostomy are relieved of their ulcer symptoms by vagotomy.¹¹ If 88 per cent of the patients with jejunal ulcer after gastro-enterostomy are relieved by vagotomy, it is difficult to see how vagotomy done in conjunction with gastro-enterostomy could fail to afford some protection against recurrent ulceration. But perhaps this paradox also can be explained by differences in the type of case used for analysis.

Walters' results in vagotomy and gastro-enterostomy are derived from a study of selected patients operated upon in the past five years. But his figures for the results of gastro-enterostomy alone are based on experiences with a group of patients whose operations date back as far as 40 years and more specifically on the results of a survey made by Gray and Williams. Gray and Williams state that in the light of their present knowledge many of the patients in this

series could have been treated satisfactorily without resort to surgical intervention if modern methods of treatment had been available.⁵ If patients with a low ulcer diathesis are subjected to gastro-enterostomy or when a certain group of cases is selected for this operation, the incidence of marginal ulcer may be low. Since many of the patients in the earlier part of this 40-year period were operated upon during the vogue of gastro-enterostomy when the indications for operation were much less rigid than they are today, and since later in this period gastro-enterostomy was employed selectively in certain groups of cases such as those with pyloric obstruction, it is not surprising that the results of gastro-enterostomy during this era were good. But when patients are carefully screened by the gastro-enterologists as they are today, it is doubtful whether results comparable to those reported by Gray and Williams could be obtained by gastro-enterostomy alone in a consecutive series of patients with complicated or intractable duodenal ulcer. If the results of gastro-enterostomy today were as satisfactory as in the older series of cases mentioned by Walters, there would have been little need to employ gastric resection with its higher mortality and morbidity. In our recent experience gastro-enterostomy alone has given satisfactory results in less than 50 per cent of the patients treated as compared to 90 per cent when vagotomy is added.²

Although some of the controversy regarding the efficacy of vagotomy with gastro-enterostomy may be explained on the basis of selection of cases, the most important factor in determining the results is the technic of the operation. Since the operation is a new one, each surgeon has had to teach himself how to do it and good results could not be expected in the first few cases. As an example of the influence of technical factors on results, the addition of vagotomy to gastro-enterostomy in one reported

series¹⁰ caused so much gastric retention that the stay in the hospital was prolonged to an average of 29 days, as contrasted to 12 days after gastro-enterostomy without vagotomy. Although gastric retention following vagotomy with gastro-enterostomy often has been attributed to the vagotomy and accepted as an inevitable complication of denervation of the stomach, our experience

TABLE I.—*Day of Discharge from Hospital after Vagotomy and Gastro-enterostomy for Duodenal Ulcer—100 Consecutive Cases.*

Number of Days Postop.	Number of Patients	Complications
4th	1	
5th	13	
6th	35	
7th	31	
8th	13	
9th	2	
10th	2	
15th	1	(Small embolism)
24th	1	(Gastric retention)
27th	1	(Cardiac arrest with resuscitation)
Average 7 days	Total 100	

indicates that gastric retention after vagotomy with gastro-enterostomy is not a natural consequence of the operation, but arises from technical factors in the making of the gastro-enterostomy.

If the stoma is to function well it must be placed exactly at the most dependent part of the stomach, as close to the greater curvature as possible, and usually close to the pylorus, just to the left of the reflection of the peritoneum of the mesocolon.³ This type of gastro-enterostomy drains by gravity and empties the denervated stomach so rapidly that there is no more gastric retention than follows a gastro-enterostomy without vagotomy. The conventional type of posterior gastro-enterostomy which may be placed in midstomach, midway between the curvatures, or opposite the esophagus¹² will not function well, because the stoma is not dependent and the denervated stomach is devoid of peristalsis and must empty by gravity.

A second factor of great importance is the technic employed in making the anastomosis. The cuff should be made as small as possible so that there will be no valve-like obstruction of the stoma. If technics in which three rows of sutures are used or if a wide cuff is inverted by two rows there will be a 15 to 20 per cent increase in the incidence of gastric retention in vagotomized stomachs.

In our last 100 consecutive cases in which a small cuff, dependent gastro-enterostomy

TABLE II.—*Vagotomy and Gastro-enterostomy for Duodenal Ulcer.*

147 patients operated on 3 to 5 years ago
140 followed 2 to 5 years
7 not traced

was employed, the average day of discharge from the hospital was the seventh. Three patients remained in the hospital longer than ten days, but in only one of these cases was the delay due to gastric retention. All patients returned to their homes without special convalescent care. One was readmitted a week later with transient retention and one was treated at home for the same. In no case was a secondary operation performed and no patient experienced persistent retention. The average maximum amount of gastric retention which occurred in 65 cases in which measurements of retention were recorded was 205 cc.

It is not necessary to maintain gastric suction for more than 24 hours after operation, provided that the stomach is aspirated once or twice daily for two or three days to make certain that there is no retention. By the sixth or seventh day the patient can be discharged on a simple diet. After the sixth week no limitations are imposed on diet or habits of living, and no medication is prescribed.

If the vagotomized stomach does not empty, food is in constant contact with the

antrum so that the hormonal mechanism of gastric secretion is stimulated and gastric, duodenal, or marginal ulceration may occur. Diarrhea is perhaps no more common following a properly performed vagotomy with gastro-enterostomy than following gastrectomy, but if the stomach does not empty, the retained food will ferment and give rise to diarrhea and belching of foul gas. These are not side effects of vagotomy but symptoms of a poorly constructed gastro-enterostomy.

Although the opponents of vagotomy and gastro-enterostomy may at times have been hypercritical, it is equally true that its supporters have been overenthusiastic. Early observations, based on one to two years' follow-up, indicated a much lower incidence of demonstrable marginal ulcer than later observations, made two to five years after operation.

In our experience with 147 patients operated upon more than three years ago, 140 have been followed by questionnaire from two to five years, and those who have had persistence or recurrence of symptoms have been recalled for examination. Analysis of the results has been a joint project carried out by the Division of Gastroenterology and the Surgical Division.

Our experience has been that the status of the patient is reflected fairly accurately by his replies to questionnaires, and that re-examination of the patient usually indicates that he is a little better off than his written reply suggested. This experience is in contrast to that of Walters, who states that replies to questionnaires are apt to present too optimistic a picture.¹⁰ Walters, however, did not analyze the same group of patients first by questionnaire and then by re-examination, but based his opinion on an analysis of two separate groups of patients, one which returned for re-examination and one which did not. Since patients with persistent symptoms would be more apt to return for re-examination, it is not surpris-

ing that the results were worse in the group which returned.

In our series, the patients operated upon represented 12 per cent of the total treated for duodenal ulcer, and in half of the cases indications of obstruction or a history of massive hemorrhages or perforations were present.

Three per cent of the 140 followed patients have required secondary operations for marginal ulcer and an additional 2 per cent have had presumptive but not demonstrable evidence that ulceration has recurred. All of these patients developed symptoms of marginal ulcer within the first two years after operation.

There have been no late recurrences of ulcer in patients who were free of symptoms for two years or more after operation. Side effects such as loss of weight, dump syndrome, or diarrhea have not been common or severe, and we have not seen belching or vomiting due to gastric retention. Bleeding (usually slight and unaccompanied by pain or roentgen ray evidence of jejunal ulcer) occurred in 6 per cent of those cases in which a history of hemorrhage was one of the indications for operation. Ninety per cent of the patients operated upon are following no dietary restrictions, are taking no medicine, are free of symptoms of ulcer and are classified as having obtained good results.¹

There have been two postoperative deaths in 445 vagotomies and gastro-enterostomies for duodenal ulcer—a mortality rate of less than 0.5 per cent. We prefer vagotomy with gastro-enterostomy as the standard treatment for all patients with duodenal ulcer except those who are bleeding actively at the time of operation. We find that vagotomy with gastro-enterostomy is safer than radical gastrectomy, is attended by a much lower morbidity, and is just as effective as all but the most radical resections in controlling the tendency to recurrent ulceration. The patients who are

well after vagotomy with gastro-enterostomy are entirely well; can eat, drink and smoke as they please, and rapidly regain their weight and strength. Moreover, the commonest complication of this operation, marginal ulcer, is correctible by resection whereas nothing can be done for the gastric cripple following radical gastrectomy.

It is important to emphasize that the so-called side effects of vagotomy can be avoided if the gastro-enterostomy is properly constructed and that the incidence of recurrent ulceration need not be high if the

TABLE III.—Results of Vagotomy and Gastro-enterostomy in 140 Followed Cases.

90%	free of ulcer symptoms and have no significant gastro-intestinal complaints
3%	reoperated for jejunal ulcer
2%	presumptive evidence recurrent ulceration
5%	unsatisfactory because of other disease or neuropsychiatric problems
Total 100%	

vagotomy is well performed. Technically it is impossible to perform a complete vagotomy in all cases, and it is for this reason that symptoms or signs of ulceration recur in about 5 per cent of the patients operated upon. Although this incidence of recurrent ulceration is admittedly higher than that which follows extremely radical gastrectomies, we believe that recurrent ulceration in a small proportion of cases is preferable to the severe nutritional disturbances which occur in a major proportion of the patients treated by the radical gastrectomies that are required to obtain more effective control of the ulcer diathesis.

Even if 5 per cent of the patients subjected to vagotomy with gastro-enterostomy later require a conservative gastric resection, the secondary operation can be performed with a risk which is often less than that of a primary resection for duodenal ulcer, and the majority of the patients so treated will be restored to health. After radical gastrectomy, on the other hand, there is nothing that can be done for the

many patients who are cured of their ulcer but who are not able to eat well or regain their weight and strength. For these reasons we would not wish to jeopardize the excellent results obtained in 90 per cent of our patients by employing radical gastrectomies which might cure more ulcers but would result in fewer well patients. And finally we believe that, as experience with the operation increases and technics improve, vagotomy with gastro-enterostomy will replace resection as the standard treatment for duodenal ulcer.

SUMMARY

1. The two most important causes of the differences in opinion regarding the value of vagotomy with gastro-enterostomy in the treatment of duodenal ulcer are

- a. Differences in selection of cases for operation
- b. Differences in the technic of operation.

2. When two or more operations are being employed in the treatment of a disease, a comparison of results is meaningless unless the same criteria are employed for selecting cases for each type of operation.

3. "Side effects" which have been attributed to vagotomy are in reality complications of an improperly functioning gastro-enterostomy.

4. If the gastro-enterostomy is properly placed and constructed there should be no prolonged gastric retention and transitory retention should not occur in over 3 per cent of the patients subjected to vagotomy and gastro-enterostomy. The average postoperative hospital stay of our last 100 patients was seven days; 49 per cent of the patients left the hospital on or before the sixth postoperative day and 97 per cent on or before the tenth.

5. Vagotomy with gastro-enterostomy affords as much protection against recurrent ulceration as a three-fourths gastric resection. More radical gastrectomies result in

a lower incidence of recurrent ulceration but cause an intolerably high incidence of nutritional complications for which there is no effective treatment.

6. Good results were obtained in 90 per cent of the patients followed for two to five years after vagotomy with gastro-enterostomy. In 3 per cent, gastric resection for marginal ulcer has been required.

7. The hospital mortality rate of vagotomy with gastro-enterostomy has been less than 0.5 per cent—(two deaths in 430 cases).

8. The safety of vagotomy with gastro-enterostomy, the absence of side effects when the gastro-enterostomy is constructed properly, and the fact that failures are still correctible by gastric resection commends vagotomy with gastro-enterostomy as the standard treatment for complicated duodenal ulcer.

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