

# Vagus Section in the Treatment of Gastrojejunal Ulcer: \*

## A Reappraisal After Long Term Follow Up

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THE RESULTS of vagus section for gastrojejunal ulcer secondary to either gastrectomy or gastroenterostomy have been adequately documented in the literature. However, despite the material already available, there still remains a paucity of information relevant to the long-term follow up of these cases. Pertinent also to the clinical results obtained from vagotomy in this syndrome is the controversial question of the return of vagal function as measured by accepted acid secretion studies.

It is the purpose of this paper to present 25 patients treated by vagisection for gastrojejunal ulcer. Analysis of these patients in the light of both a five-year and ten-year follow up, and observations obtained from a series of acid secretion studies will be presented.

### Diagnosis

It is an acknowledged fact that not all patients with symptoms of gastrojejunal ulcer can be objectively diagnosed. Walters has stated that only 50 per cent of marginal ulcers occurring after gastrectomy can be demonstrated roentgenographically, and only 37 per cent of ulcers following gastrojejunostomy are identified by barium studies. A similar experience was noted in this series. Thirteen patients had x-ray evidence of ulceration or gastrojejunitis prior to vagotomy; in five patients perforation had occurred to prove the recurrence. In the remaining seven patients pain and proven melena served as the indications for operative therapy. In three of this latter group, subjected to infra-diaphragmatic vagotomy

at intervals up to three weeks following admission, there was no evident pathologic change noted in the stomach or jejunal loops. However, because of the well-documented history of pain and bleeding, and the knowledge that mucosal healing can occur in a short time interval between diagnosis and operation, these patients were not excluded from the series.

### Acid Secretion Studies

The Hollander insulin test, which lent itself to testing out-patients was employed in the majority of patients following vagotomy. Although the effect of hypoglycemia on gastric secretion must be considered in relation to all gastric secretory nerves, and is in no way a quantitative test, it was believed that repeated tests on each patient, performed in a standardized manner, would have some statistical importance. Accepting some variation due to the presence of a gastroenteric stoma and individual patient lability, it was surprising to note the uniformity obtained in many patients subjected to yearly Hollander-type gastric analyses.

### Method

After initially emptying the stomach, 30 units of regular insulin was administered intravenously and gastric aspirations were carried out every half hour for three hours. The free HCl and total acid contents of the specimens were determined in the standard fashion using 0.1N NaOH. In all patients tested, the blood sugar level was reduced to 50 mg. % or the test was repeated. No test was considered "positive"

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TABLE 1. Results of Insulin Tests in Patients Tested Annually for Ten Years Postvagotomy

Case No.	Preoperative Gastric Analysis		Postoperative Insulin Test	1950** Insulin Test	Follow up Insulin Test
1	Free acid Total acid	None 24 units	Negative 1947	Negative 22 months	Negative 10 years
2	Free acid Total acid	96 units 80 units	Negative 1947	Negative 21 months	Positive 6 years
3	Free acid Total acid	18 units 18 units	Negative 1947	Negative 18 months	Negative 10 years
4	Free acid Total acid	83 units 30 units	Negative 1947	Negative 17 months	Negative 10 years
5	Free acid Total acid	None 35 units	Negative 1947	Negative 13 months	Negative 10 years
6	Free acid Total acid	20 units 62 units	Negative 1947	Negative 19 months	Died*
7	Free acid Total acid	33 units 135 units	Negative 1947	Negative 24 months	Positive 5 years
8	Free acid Total acid	38 units 60 units	Negative 1948	Positive 6 months postoperative	Not done
9	Free acid Total acid	16 units 25 units	Negative 1948	Negative 18 months	Negative 10 years
10	Free acid Total acid	None 48 units	Negative 1948	Negative 18 months	Positive 6 years

\* Died two years postoperative, cerebral hemorrhage.

\*\* Results previously reported.<sup>4</sup>

unless at least a 30 unit rise of the free HCl from the established resting level occurred. The maximum secretion response occurred within two hours following insulin injection in the majority of patients. In an experience with some 150 tests, performed under these conditions over a ten year period, it was apparent that a rise of lesser degree than 30 units in the free HCl could not be accepted as significant. It was learned, as mentioned above, that the variance per patient each year was surprisingly small. When a "positive" test did occur after a series of negative findings the return of vagal-like function was seriously considered.

### Results

Ten patients of the 25 being reported had vagus section performed in 1947 to '48. Acid studies on these individuals were included in a preliminary report in 1951<sup>4</sup> (Table 1).

Nine of these individuals have been followed with yearly insulin tests for a ten-year period.\* As noted in Table 1 each patient had a negative insulin test in the immediate postoperative period. One pa-

\* Patient No. 6 died two years following vagotomy of a cerebral hemorrhage. He had been asymptomatic for this interval.

tient (Case 8) showed a positive test concomitant with recurrence of ulcer symptoms six months following vagotomy, and it was assumed that an incomplete vagotomy had been performed. Of the remaining eight cases, three had a reversal of the insulin tests from an established negative to positive at either five or six years post-vagotomy. Recurrence of symptoms and objective evidence of gastrojejunal ulcer occurred in two of these three patients at approximately the same time as the change in the acid secretion tests was noted. The third patient showing reversal from a negative to a positive secretion test (6 years postvagotomy) remains symptom-free ten years postvagotomy.

The remaining 15 patients, followed for at least five years after vagotomy, were also subjected to periodic insulin secretory studies. Thirteen of these patients had annual acid secretion tests performed and all had negative Hollander tests six months or more following operation. In this group of individuals, three patients suffered ulcer recurrence, one at 18 months, one at 20 months, and one at 24 months after apparent complete severance of the vagi. All had positive insulin tests at the time of recurrence.

In summary therefore, of the 25 patients studied one had a positive test less than six months after vagotomy and it may be presumed that the operation was incomplete. Of the remaining 24 patients, six had apparent reversal of their Hollander tests at periods varying from 18 months to six years postvagotomy and five in this latter category had proven recurrence of ulceration at approximately the same time.

### Discussion

The permanence of vagus section has been a controversial subject for some time. Dragstedt *et al.*,<sup>3</sup> although proponents of this procedure, have reported that three of 13 patients were found to have a positive reaction to insulin tests one, two, and five

years following apparent complete vagotomy. The effect of this reversal was not stated, although Dragstedt reports only two-thirds of patients will remain well in the presence of a positive test. Rowe *et al.*,<sup>5</sup> reviewing a series of 150 vagotomized patients, found no evidence of return of gastric tone or contraction, or reversal of insulin secretion tests on 12 hour gastric analyses, for a follow up period of up to six and one-half years.

Our findings, however, would agree with those of Brooks and Moore,<sup>1</sup> who noted, after a study of 24 patients, that although many continued to have a flat insulin gastric secretion curve even eight or nine years postvagotomy, with the passage of time, positive tests and higher free acid became apparent. The significant fact that six patients of the 25 studied in this series showed documented reversal of the acid secretion studies following hypoglycemia, and that five of these individuals coincidentally developed marginal ulcer recurrence, is convincing evidence that the vagotomy effect is not permanent. It should be emphasized that these findings indicate return of parasympathetic innervation, not necessarily regeneration of the vagus nerves or return of function of incompletely severed vagi.

### Clinical Results

Of the 25 patients comprising this study, ten had vagotomy performed in 1947 to 1948. A ten year follow up study is available for nine of these patients. As reported in 1951 with only a three-four year follow up available, eight of the nine patients appeared symptom free. However, a ten-year appraisal of this small group of eight good results revealed two recurrences, one at five years and another at six years following vagotomy (Table 2). In the group of 15 vagotomized patients followed for five years or more, there were three recurrences noted, as described above, one at 18 months, one at 20 months and one at two years.

TABLE 2. *Clinical Results Obtained in Ten-Year Follow up for Marginal Ulceration Treated by Vagotomy (Ten Patients)*

Case No.	Last Gastric Procedure	Year	Year of Vagotomy	Result 1951	Result 1957
1	Gastrectomy	1945	1947	Good	Good
2	Gastrectomy	1944	1947	Good	Recurrence 1953
3	Gastrectomy	1942	1947	Good	Good
4	Gastrectomy	1946	1947	Good	Good
5	Gastroenterostomy	1920	1947	Good	Good
6	Gastrectomy	1933	1947	Died* 1949	
7	Gastrectomy	1940	1948	Good	Good
8	Gastroenterostomy	1936	1948	Recurrence (6 months)	Gastrectomy 1955
9	Gastroenterostomy	1922	1948	Good	Good
10	Gastroenterostomy	1922	1948	Good	Recurrence 1953

Thus, in the entire group six patients of the 25 or 24 per cent proved to have recurrences after vagotomy which, in five of the six, was presumed adequate as illustrated by a negative insulin test at least six months or more after operation. Of this group of six patients four had recurrence occur less than five years following operation and two had recurrence after five years (Table 3).

The statistics are improved, however, if the recurrences are grouped according to gastrectomized patients with marginal ulcer treated by vagotomy versus patients having vagotomy for marginal ulcer secondary to gastro-enterostomy. It will be noted as illustrated in Table 4 that of the series of 25 patients, 20 had marginal ulceration secondary to apparently adequate gastrectomy. Vagotomy in this group produced a good clinical result in 17 patients or 85 per cent. In the five patients treated for marginal ulcer secondary to gastro-enterostomy vagotomy failed to prevent recurrence in three or 60 per cent.

TABLE 3. *Follow up Analysis of 25 Patients with Gastrojejunal Ulcer Treated by Vagotomy*

Total number patients	25
Failures (under 5 years)	4
Failures (5-10 years)	2
Failures—Total	6 (24%)

### Discussion

The analyses presented above serves to emphasize the fact that gastric resection is the procedure of choice for marginal ulcer occurring after gastrojejunostomy. The initial enthusiasm by the authors, for employing vagotomy in the above group of patients, has been tempered by the results of a longer follow up. This finding contrasts somewhat with Walters' <sup>6, 7</sup> conclusions who reported 70.5 per cent good results from vagotomy in 78 patients with marginal ulcer secondary to gastrectomy and 77.8 per cent good results in 27 patients with marginal ulcer secondary to gastro-enterostomy. However, the follow up period was not clearly defined in this latter series. The author's results also differ in part with the opinion of Crile,<sup>2</sup> who reported improvement in 15 of 18 patients treated by vagotomy for marginal ulcer secondary to gastro-enterostomy and no failures in 13 patients treated by vagotomy for ulcer secondary to gastrectomy. Follow up in this report, however, was limited to a nine to 44 month period.

It would appear from the study that despite an increased mortality rate (Walters <sup>6, 7</sup>), patients with gastrojejunal ulcer following gastro-enterostomy should be subjected to adequate gastrectomy, and pa-

TABLE 4. *Clinical Results in 25 Patients with Gastrojejunal Ulcer Treated by Vagotomy*

Recurrence After Adequate Gastrectomy		Recurrence After Gastro- enterostomy	
Number patients	20	Number patients	5
Failures (under 5 yrs.)	2	Failures (under 5 yrs.)	2
(5-10 yrs.)	1	(5-10 yrs.)	1
Total failures	3 (15%)	Total failures	3 (60%)

tients developing marginal ulceration after gastrectomy can be satisfactorily treated with vagotomy. Long-term follow up of five and ten years will show recurrences even in the latter category.

### Summary

1. Five- and ten-year follow up studies on 25 patients treated by vagus section for gastrojejunal ulceration are presented.
2. The permanence of vagotomy is questioned in the light of long term follow up in these patients.
3. Vagotomy is an effective procedure in the treatment of marginal ulcer secondary to adequate gastrectomy.
4. Gastrectomy rather than vagotomy should be utilized in the therapy of gastrojejunal ulceration subsequent to gastroenterostomy.

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