

annually, and this paper describes the latest results obtained on them at follow-up five to eight years after operation:

(1) Most "postgastric operation syndromes" occurred with roughly equal frequency after all three operations, but early dumping was marginally more common and severe after subtotal gastrectomy; however, it very seldom assumed crippling proportions. Diarrhoea was certainly more frequent after the two vagotomy operations than after gastrectomy, but most of it was very slight and occurred episodically, so that it was only rarely a source of disability.

(2) A comparison between the postoperative weight of patients and the optimal weight of individuals of the same age and height, as calculated from life assurance tables, showed a distinctly greater reduction of weight after gastrectomy and vagotomy and antrectomy than after vagotomy and gastroenterostomy.

(3) Recurrent ulceration was diagnosed in 7 to 10% of patients after vagotomy and gastroenterostomy and in 2 to 5 or 6% of patients after vagotomy and antrectomy or subtotal gastrectomy.

(4) Overall assessment of the quality of the results (Visick grading) after the three operations showed vagotomy and antrectomy and subtotal gastrectomy to be slightly superior to vagotomy and gastroenterostomy, but the difference was statistically insignificant. The results of all operations tended to deteriorate gradually with the passage of time.

The results in female patients were analysed only in those who had had vagotomy and gastroenterostomy. A comparison of the outcome of this operation in women and men, revealed

that the results were distinctly poorer in the former, with a higher incidence of most postgastric operation symptoms and of recurrent ulceration than in men.

We would like to express our thanks to the following for their assistance in the conduct of this study: Mrs. R. Nicolson, Mrs. M. A. Pybus, and Miss Lyn Alexander for secretarial services; Mrs. Dent for help in tracing patients; and the Medical Research Council, the Board of Governors of the United Leeds Hospitals, and the York Peptic Ulcer Research Trust for grants to defray some of the costs of the investigations.

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Clinical Comparison of Vagotomy and Pyloroplasty with Other Forms of Elective Surgery for Duodenal Ulcer*

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When the controlled trial of elective surgery for duodenal ulcer in Leeds and York (Goligher *et al.*, 1968) closed for admission of new cases in 1962, in accordance with current trends vagotomy and pyloroplasty became the operation of choice for this condition in the University Department of Surgery at the General Infirmary, Leeds, and in the Surgical Department of the York hospitals. Some 90% of our duodenal ulcer patients coming to elective operation now have this operation, the remaining 10% being treated instead by vagotomy and gastroenterostomy because of anticipated technical difficulties from oedema or scarring of the first part of the duodenum if a pyloroplasty were attempted. Up till 1965 only total truncal vagotomy was employed in conjunction with either of these forms of gastric drainage, but in the past two years selective vagotomy has been under trial in Leeds, though not in York.

In this article we wish to report on the immediate outcome and results at two years after operation in a series of 175 men

with duodenal ulcer treated by elective truncal vagotomy and Heineke-Mikulicz pyloroplasty (see Fig.) in accordance with this policy in York and Leeds between January 1963 and July 1965.

Findings

Operative Mortality.—There were two deaths in the immediate postoperative period, both due to acute cardiac failure, one complicating bronchopneumonia. In neither instance could the fatal outcome be attributed to any technical failure of the operation.

Subsequent Deaths.—Four patients died after discharge from hospital, one from bronchial carcinoma, one as a result of a road accident, and two from causes not clearly ascertained but not obviously connected with the original ulcer or the operation undertaken for its cure.

Cases Failing to Attend for Review at Two Years.—Eleven patients have been lost to follow-up or did not attend for their annual review two years after operation, and were therefore not available for inclusion in this survey of the results at that particular time.

Cases Reviewed at Two Years.—The remaining 158 patients have been interviewed and examined two years after operation. The clinical results obtained in these cases are analysed and

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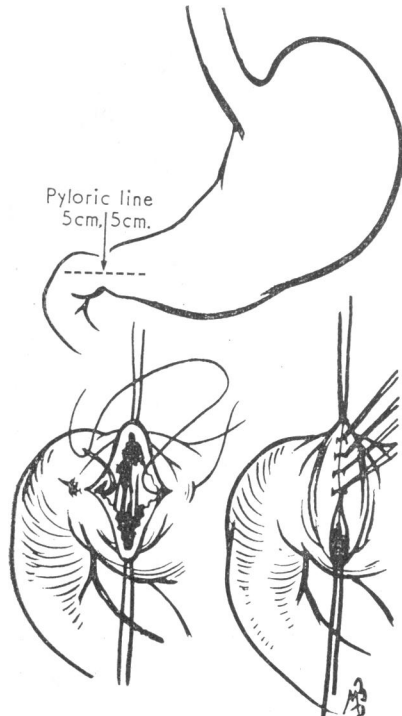
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compared with the results recorded two years postoperatively in male patients treated by three alternative forms of operation—namely, vagotomy and gastroenterostomy, vagotomy and antrectomy, and subtotal gastrectomy—in connexion with the Leeds/York controlled trial of various forms of elective surgery for duodenal ulcer (Goligher *et al.*, 1968). It is not denied that there may be some slight dissimilarities in the composition of these contrasted series of cases, but the follow-up assessments were conducted by the same group of investigators using exactly the same criteria and “blind” routine for all cases.



Vagotomy and Heineke-Mikulicz pyloroplasty. Note that cut in the pyloroduodenal region extends 5 cm. on either side of the actual pylorus.

Frequency of Symptoms Due to Alimentary Dysfunction

The relative frequency of most of the commoner postgastric operation symptoms two years postoperatively is shown in Table I. One of the advantages claimed by Holt and Lythgoe (1965) and others for pyloroplasty over gastroenterostomy as the drainage procedure to use in conjunction with vagotomy was that there was a lower incidence of *bile vomiting* after it. Our analysis supports this contention, for bilious regurgitation occurred less often after vagotomy and pyloroplasty than after any of the other operations, and particularly vagotomy and gastroenterostomy, but the differences are statistically far from significant. Three symptoms which were found more frequently after vagotomy and pyloroplasty than after any other operation

TABLE I.—Incidence of Symptoms of Alimentary Dysfunction Two Years After Various Types of Operation for Duodenal Ulcer

Symptom	Vag. & G.E. in Trial (% of 110 Cases)	Vag. & Antr. (% of 106 Cases)	Subtot. Gastr. (% of 93 Cases)	Vag. & G.E. Reject (% of 84 Cases)	Vag. & Pyloroplasty (% of 158 Cases)
Nausea	16.4	15.4	20.0	10.8	26.3
Bile vomiting ..	16.4	13.6	12.1	12.0	10.9
Food vomiting ..	6.4	4.9	10.0	4.9	7.7
Epigastric fullness ..	28.2	35.0	40.0	22.9	46.8
Early dumping ..	11.0	10.7	16.6	15.7	9.7
Late dumping ..	6.4	5.9	1.1	1.2	3.2
Flatulence	12.1	17.5	15.5	11.3	31.4
Heartburn	15.0	15.5	2.2	16.3	17.5
Dysphagia	0.0	0.0	0.0	3.8	0.7

Vag. & G.E. = Vagotomy and gastroenterostomy. Vag. & Antr. = Vagotomy and antrectomy. Subtot. Gastr. = Subtotal gastrectomy.

were *epigastric fullness, flatulence, and nausea*, but for the most part these differences were not statistically significant.

One symptom not included in Table I is *diarrhoea*, because the recorded data on bowel function in the cases in the Leeds/York trial two years after operation were not sufficiently detailed to allow of a fair comparison with the fuller information we now elicit from patients after gastric surgery. Accordingly we have thought it preferable to use the assessments on bowel habits made on these trial cases at their latest follow-up five to eight years after operation (Table II). The validity of a comparison between these findings made so long after operation and the results obtained in vagotomy and pyloroplasty patients two years after operation (Table III) is admittedly open to question. But, while we would agree that the pattern of bowel habit in a patient after vagotomy is apt to change a good deal during the first year or 18 months postoperatively, it is our impression from very many consecutive follow-up studies that it has usually reached its final form by two years. Consequently we believe that it is reasonable to compare these findings on bowel habits even though they were recorded in some of the patients at two years and in others between five and eight years.

TABLE II.—Bowel Habit Five to Eight Years After the Three Operations in the Leeds/York Controlled Trial of Elective Surgery for Duodenal Ulcer

Bowel Habit	Vag. & G.E. (% of 118 Cases)	Vag. & Antr. (% of 112 Cases)	Subtot. Gastr. (% of 107 Cases)
No change	42.3	39.3	57.0
Improved	31.4	37.5	36.5
Diarrhoea	26.3	23.2	6.5
Mild or moderate ..	21.2	20.5	5.6
Severe	5.1	2.7	0.9

TABLE III.—Bowel Habit Two Years After Vagotomy and Pyloroplasty

Bowel Habit	Vagotomy and Pyloroplasty (% of 158 Cases)
No change	44.3
Improved	33.5
Diarrhoea	22.2
Mild or moderate ..	20.3
Severe	1.9

It will be seen that the various alterations in bowel habits occur in roughly the same proportions after vagotomy and pyloroplasty as they do after operations involving vagotomy, but the incidence of diarrhoea—certainly of severe diarrhoea—is less after pyloroplasty than after gastroenterostomy. However, this difference is not statistically significant.

Recurrent Ulceration

The incidence of recurrent ulcer, proved at laparotomy or very strongly suspected on clinical and radiological grounds, two years after vagotomy and pyloroplasty and the other operations is shown in Table IV, from which it would appear that in our hands the former operation is more prone to be followed by recurrence of ulceration than is any of the other procedures studied. (It is only fair to point out, however, that because of the distortion produced in the pyloroduodenal region by pyloroplasty postoperative radiological examination for recurrent ulcer is particularly unreliable after this operation. Consequently the surgeon may be less confident about excluding further ulceration as a cause of symptoms, so that there may

TABLE IV.—Recurrent Ulceration at Two Years After Various Operations

Degree of Certainty	Vag. & G.E. in Trial (110 Cases)	Vag. & Antr. in Trial (106 Cases)	Subtot. Gastr. in Trial (93 Cases)	Vag. & G.E. Reject (84 Cases)	Vag. & Pyloroplasty (158 Cases)
Proved ..	1 → lap	0	0	0	4 (3 → lap 1 x-ray)
Suspected	3	0	0	2	6
Total	4	0	0	2	10

be a greater inclination to diagnose recurrent ulceration after pyloroplasty.) Particularly impressive in this respect is the absence of any recurrent ulcers at this stage after the two resection operations—subtotal gastrectomy, and vagotomy and antrectomy—compared with an incidence of 3.6% for vagotomy and gastroenterostomy and 6.3% for vagotomy and pyloroplasty.

Visick Grading

We have used a classification of overall functional results closely following that proposed by Visick (1948), which recognizes four categories of result (Goligher *et al.*, 1968). The Visick grading at two years after the various types of operation is shown in Table V. It will be seen that vagotomy and pyloroplasty is followed by a higher proportion of category IV results than any other operation, except vagotomy and gastroenterostomy in cases rejected from our controlled trial. The percentage of cases in categories I and II after it is also lower than after any of the other types of operation without exception, but the differences in this latter respect—even between it and vagotomy and antrectomy—fail to be significant ($P > 0.1$). However, there is a significant difference between the combined category I and II score of vagotomy and pyloroplasty and of vagotomy and antrectomy and subtotal gastrectomy when taken together ($P < 0.05$).

TABLE V.—Visick Grading of Patients Two Years After Various Operations for Duodenal Ulcer

Visick Grading	Proportion of Cases in Each Category After:				
	Vag. & G.E. in Trial (% of 110 Cases)	Vag. & Antr. in Trial (% of 106 Cases)	Gastrectomy in Trial (% of 93 Cases)	Vag. & G.E. Rejects (% of 84 Cases)	Vag. & Pyloroplasty (% of 158 Cases)
1	54	58	60	47	37
2	19	26	23	23	27
3	22	12	15	18	24
4	5	4	2	12	12
	}73	}84	}83	}70	}64

Discussion

The present popularity of pyloroplasty instead of gastroenterostomy as the method of gastric drainage for use in conjunction with vagotomy is apparently based on its more physiological nature and on the expectation or finding of fewer post-operative symptoms due to disturbances of alimentary function, such as bilious vomiting, though a slightly higher incidence of recurrent ulceration has been reported by some authors (Weinberg *et al.*, 1956 ; Burge, 1964 ; Holt and Lythgoe, 1965 ; Schofield *et al.*, 1967). Our own data on the relative results of vagotomy and pyloroplasty and of other operative methods may be to some extent invalidated by dissimilarity in the series of cases we have contrasted—though assuredly not more so than in most other published comparisons of this kind. The value of our comparative assessments may also be lessened by the fact that they were made such a short period as two years after operation. But, for what they are worth, our findings have failed to reveal any significantly lower incidence of symptoms of alimentary dysfunction after pyloroplasty than after gastroenterostomy (Tables I, II, and III). Indeed, our impression is that the overall functional results after pyloroplasty may be

poorer than after gastroenterostomy (Table V), but again the difference is statistically insignificant. We have also found an apparently greater tendency to further ulceration after vagotomy and pyloroplasty than after vagotomy and gastroenterostomy (Table IV). Our findings, which can only be tentative at this early stage, would lead us to doubt the alleged advantages of vagotomy and pyloroplasty over vagotomy and gastroenterostomy.

It would be reasonable, too, to question whether pyloroplasty is as safe a drainage operation for routine use as gastroenterostomy. Neither of the two operative deaths in our series of 175 cases treated by vagotomy and pyloroplasty could be directly related to the choice of this particular operation, but we have encountered three or four instances of leakage and fistulation following the use of vagotomy and pyloroplasty in other cases under our care, two with fatal outcome. These experiences emphasize the importance of avoiding this operation in any patient in whom serious technical difficulties might be apprehended in the performance of pyloroplasty.

Summary

Between 1963 and 1965, 175 men with duodenal ulcer were treated by elective truncal vagotomy and Heineke-Mikulicz pyloroplasty with two operative deaths from cardiac complications and four subsequent deaths unrelated to operation. Of the 169 surviving patients 158 attended for review two years after operation. The results elicited were contrasted with those obtained in a previous study of patients two years after elective vagotomy and gastroenterostomy, vagotomy and antrectomy, and subtotal gastrectomy for duodenal ulcer:

- (1) Of the various postgastric operation syndromes the only ones that were less common after vagotomy and pyloroplasty than after vagotomy and gastroenterostomy were bilious vomiting, early dumping, and diarrhoea, but the differences were statistically insignificant.
- (2) Within two years of operation recurrent ulceration had been diagnosed in 6.3% of patients after vagotomy and pyloroplasty, as contrasted with 3.6% of patients after vagotomy and gastroenterostomy and none of the patients after vagotomy and antrectomy or subtotal gastrectomy.
- (3) Overall assessment (Visick grading) of the outcome after the various operations gave poorer results after vagotomy and pyloroplasty than after any other method; the difference as compared with vagotomy and antrectomy or subtotal gastrectomy was statistically significant, but as against vagotomy and gastroenterostomy it failed to achieve significance.

We should like to express our thanks to the following for their assistance in the conduct of this study: to Mrs. R. Nicolson, Mrs. M. A. Pybus, and Miss Lyn Alexander for secretarial services; to Mrs. Dent for help in tracing patients; and to the Board of Governors of the United Leeds Hospitals and the York Peptic Ulcer Research Trust for grants to defray some of the costs of the investigation.

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