Selective surgery for peptic ulcer: a review

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EDITORIAL SYNOPSIS Peptic ulcer patients do not fall into one secretory pattern and methods are available by which the secretory pattern may be assessed. Provided this assessment is accurate and the operation appropriate to the requirements of the individual patient is carried out, the side-effects are not severe.

The mortality from gastric surgery need not be above 1% and even when resection is involved the technical hazards of the operation are rarely the cause of death in experienced hands.

Further improvement in immediate and long-term results and protection against recurrence may be expected as the principles of selection become better understood and surgical procedures adequate to each requirement become standardized.

THE EVOLUTION OF PEPTIC ULCER SURGERY

Braun described the first jejunal ulcer following gastro-enterostomy in 1899. At first the blame was laid on the technique of the anastomosis. The suture material, the methods of approximating the mucosal edges, the use and abuse of clamps, and oral sepsis all came under critical review. As late as 1926 Moynihan tended to blame the suture material or the presence of oral sepsis for the stomal ulcers he encountered but he did note that in the majority of those who developed stomal ulcers a high level of gastric acidity had been recorded. It was noted that stomal ulcers rarely, if ever, followed operations for cancer. They were more common in men than in women, more common in operations for duodenal ulcers than for gastric ulcers, and more common after gastro-enterostomy than after gastrectomy, except in those cases where a Roux en-y anastomosis had been performed. From this it was rightly inferred that the acid secretion of the stomach was the major factor in initiating a stomal ulcer and this was confirmed by the work of Mann and Williamson (1923), who demonstrated conclusively by experiments on dogs that ulceration followed any operative procedure which prevented the neutralization of the acid gastric secretions.

Moynihan, who may be considered the doyen of gastric surgeons, continued to practise the operation of posterior gastro-enterostomy throughout his surgical career and claimed a recurrence rate of 1.6% (1926). Ogilvie (1938) assessed the incidence of stomal ulcer at 20% and it became increasingly obvious in the 1930s that even in the most skilled

hands gastro-enterostomy was followed by a 30% incidence of stomal ulceration (Berg, 1930) which was more difficult to control than the original ulcer. Surgeons then turned their attention to gastric resection as a primary operation for duodenal as well as gastric ulcer, but even a two-thirds gastrectomy, while effective in the case of a gastric ulcer, still carried a 5% to 7% recurrence rate in cases of duodenal ulcer (Smithwick, Harrower, and Farmer, 1961). Higher and more radical procedures were devised till Visick in 1948 published his results for 'measured gastrectomy'. By this was meant a resection of the first part of the duodenum and the entire stomach except for a small pouch at the cardia supplied by the uppermost short gastric artery. This operation was eminently successful in relieving the patient of ulcer symptoms and in protecting him against a recurrence, but it brought in its train a whole series of post-gastrectomy symptoms, which in themselves were incapacitating. Capper and Butler (1951) estimated that 12% of gastrectomy operations were followed by the early or immediate post-gastrectomy syndrome. Tanner (1954) put the figure as high as 28.5%, 7.6% of these being described as severe. The more radical the gastrectomy the more troublesome the syndrome became. A not inconsiderable death rate, estimated at 4%, shook the faith of many in these more radical procedures.

With the introduction of vagotomy by Dragstedt and Owens (1943) a new approach to the problem opened up. Dragstedt held that the most important single factor in the pathogenesis of duodenal ulcer was hypersecretion of acid during the hours of sleep and that this could be abolished by vagotomy. The

present writer and Johnson (Orr and Johnson, 1947; Orr, 1948) described the effects of vagotomy on duodenal ulcer patients. While the output of basal secretion was markedly reduced and the ulcer symptoms disappeared, other unpleasant sequelae manifested themselves. These were delayed gastric emptying with foul-smelling eructation, diarrhoea, and hypoglycaemic attacks, and they expressed the view that vagotomy should only be employed as an adjunct to gastric resection or gastro-enterostomy and only in those patients in whom there could be demonstrated an excess of vagal phase secretion as evidenced by a 12-hour nocturnal secretion test. British surgeons were slow to accept either the concept of selection of cases for vagotomy or the policy of making vagotomy a secondary part of an operation designed primarily to eradicate the ulcer. The combination of a drainage operation with vagotomy found some favour and, provided the stomach drained readily, some of the most serious drawbacks of vagotomy were removed. Opinion became divided into those who would have nothing to do with vagotomy on the grounds that it was an unphysiological procedure and might be expected to give rise to serious disturbances in biliary and pancreatic function, and the opposite school of thought, which maintained that vagotomy was harmless provided it was accompanied by a drainage procedure (Holt, 1959), and could be applied with impunity to all who suffered from duodenal ulcer. Burge (1960a) sought to reduce the unpleasant side-effects of vagotomy by selecting the fibres passing to the stomach and avoiding those supplying the hilum of the liver, the biliary tract, and the pancreas. The writer and Johnson continued to select cases for vagotomy by estimating the basal night secretion and the effect of an insulin test meal. Where vagotomy was reserved for those whose secretion was predominantly of nervous origin and was combined with a limited gastrectomy (half to two-thirds), they were able to report a relative absence of unpleasant sequelae, but when vagotomy was carried out in the absence of a high basal secretion, diarrhoea and intestinal ileus were occasionally encountered (Johnson and Orr, 1954).

A very comprehensive literature has accumulated recording the long-term results of various procedures carried out for gastric, duodenal, and stomal ulcer. In all but a few reports of recent origin surgeons have tended to apply one standard procedure to all cases, whether the procedure be adequate gastrectomy, vagotomy and gastro-enterostomy, vagotomy and hemigastrectomy, or vagotomy and pyloroplasty. Bruce, Card, Marks, and Sircus (1959) and Hollender, Adloff, and Weiss (1960) advocate selective surgery.

LONG-TERM FOLLOW-UP RESULTS Brookes, Waterhouse, and Thorn (1960) surveyed a series of 900 gastrectomy operations carried out by different surgeons with varying techniques. The mortality overall was 3.8% for elective procedures, being less for patients under 54 years of age and greater for those over 54. Of the total, 12% had to be classified as unsatisfactory, though the results in the vast majority were most gratifying. It was found that when more than two-thirds of the stomach was resected 21% were unsatisfactory in that they developed one or more side-effects, but only 9.7% developed post-gastrectomy disability when less than two-thirds was resected. The difference between those with and without a valve was not great but retro-colic anastomosis produced 10% of unsatisfactory results as against 15% when the anastomosis was anti-colic.

Burge (1960b) reports two parallel series in which vagotomy was the essential element in both, but in one series the drainage procedure was gastro-enterostomy and in the other pyloroplasty (Table I).

TABLE I

TWO PARALLEL SERIES REPORTED BY BURGE	
<i>Gastro-enterostomy and Vagotomy</i>	<i>Pyloroplasty and Vagotomy</i>
3.8% developed anastomotic ulcer	3.1% developed recurrent ulcer
0.7% developed gastric ulcer	2.1% developed gastric ulcer
0.3% developed stenosis	4.7% developed stenosis

There was in the first series 4.8% and in the second series 10.1% of patients who required further resection, but this takes no account of unpleasant side-effects which may add to the number of unsatisfactory results. Burge (1960a) estimated that when there is complete vagotomy severing the main branches as they pass through the hiatus, 30% of patients develop diarrhoea. In some this may be quite crippling and to minimize this disability he selects the branches passing to the stomach for division and spares those passing to the liver and coeliac ganglion. The mortality of these lesser procedures is in the region of 1%, but it is doubtful if the results classed as satisfactory are better than, or even as good as, those claimed for adequate gastrectomy. In the series of selective vagotomies reported herewith diarrhoea has not been a troublesome feature and other observers applying vagotomy to all cases have reported an incidence of diarrhoea of only 4 to 10%.

In America, the combination of a limited gastrectomy with vagotomy is gaining favour. Smithwick *et al.* (1961) report a series of vagotomy combined with hemigastrectomy and compare the results of this procedure with those of subtotal gastrectomy

TABLE II
COMPARISON MADE BY SMITHWICK OF TWO PARALLEL SERIES

	Mortality (%)	Stomal Ulcer (%)	Category I: Very Well (%)	Category II: Minor Complaints (%)	Category III: Serious Complaints (%)	Category IV: No Better (%)
Hemigastrectomy and vagotomy	2	1.1	20	42	24	5
Subtotal gastrectomy	3.3	7	17	36	28	19

(Table II). In view of these results Smithwick *et al.* favour hemigastrectomy and vagotomy.

Herrington, Edwards, Classen, Carlson, Edwards, and Scott (1959) report a series in which antrectomy and vagotomy were performed. That is to say, nervous and hormone stimulation were drastically reduced but none of the parietal cell mass was resected. One hundred and seventy-five patients underwent a Billroth I type of resection and 339 a Billroth II type of resection. Only two developed stomal ulcer. The mortality rate for elective operation was 1.7%. There was no striking difference between the results of the Billroth I series as against the Billroth II series, but Billroth I was reserved for small, easily resectable duodenal ulcers and Billroth II for large adherent ulcers. They classify their end-results as follows:—Category I 62%, category II 30%, category III 5%, and category IV 3%. Considerable latitude must be allowed for the personal factor in assessing categories, but categories I and II are considered to be satisfactory and categories III and IV unsatisfactory.

It is apparent from these reports that a gratifying percentage of peptic ulcer patients receive great benefit from modern surgery, but there is an appreciable mortality rate for the more radical procedures. This seems to be due to difficulties encountered in dissecting and closing the duodenum in the presence of duodenal ulcer. Each surgical procedure carries its own appreciable ratio of unsatisfactory results, ranging from unpleasant side-effects to complete failure. The nature of these side-effects varies between one procedure and another and it is at least reasonable to consider whether if one procedure has failed in one group of cases another procedure might not have been successful.

The following questions merit consideration: 1 Are the problems of ulcer surgery the same in all patients? 2 Are the problems of the gastric ulcer different from those of duodenal ulcer? 3 Do all duodenal ulcers belong, as is so often alleged, to one secretory pattern and are they all hypersecretors? 4 May one phase of secretion predominate in one patient and another phase in another? 5 If there is a wide range of difference between the secretory pattern of one patient and another, is it possible to

select patients for the procedure best suited to their individual needs?

If there is any reliable criterion by which patients may be assessed and if surgery best suited to the individual be performed, we shall be on the road towards narrowing down the group of failures to inconsiderable proportions.

It is towards this end that this study is directed. A series of 1,502 patients has undergone elective operative procedures for peptic ulcer by the author and his senior registrars during the years 1949-60. A policy of selection has been evolved, somewhat sketchy in the early phases, but becoming crystallized in the light of experience. As the differences in secretory pattern have become better understood, so also have the results improved.

PHYSIOLOGY OF GASTRIC SECRETORY ACTIVITY One fact relating to gastric secretion stands out above question, *viz.*, the source of the acid is the parietal cell mass, which is scattered throughout the mucosa of the fundus and body of the stomach. This cell mass varies in density from one person to another but in those whose stomachs secrete in excess the parietal cell mass is greater than normal. Cox (1952) has estimated that the average parietal cell count in subjects not suffering from duodenal ulcer is 1.09 billion in males and 0.82 billion in females. In those suffering from duodenal ulcer, however, the average male count is 1.90 billion and the average female count 1.52 billion. In those suffering from gastric ulcer the average for male and female counts was 0.80 billion. Card and Marks (1960) found a slightly lower count, 1.72 billion in duodenal ulcer subjects and 0.63 billion in gastric ulcer subjects. Marks and Shay (1959) demonstrated also that the average maximal histamine response in normal people was 12.2 milliequivalents of HCl in 30 minutes, but in duodenal ulcer subjects the average response was 21.5 milliequivalents, and in gastric ulcer subjects 11.3 milliequivalents. They demonstrated furthermore that one billion parietal cells were capable of secreting 11.2 to 12.5 milliequivalents.

The stimuli which act on the parietal cells and the pathways along which they operate are unfor-

tunately less well defined. A review of recent work on gastric secretion shows that there are still some aspects of this complex subject on which opinion is divided. There is, however, a general consensus of opinion that two groups of stimuli, nervous and hormonal, are responsible for acid secretion. On the one hand there are stimuli of cephalic origin operating through the anterior hypothalamus and vagal tract, and others through neural pathways via the pituitary and adrenal cortex. These may be classed as nervous stimuli. Dragstedt is of the opinion that the basal acid secretion is entirely nervous in origin and can be abolished by complete vagotomy. The second group comprises the hormonal or chemical stimuli, which originate in the pyloric antrum and in the jejunum.

There is no doubt that the majority of duodenal ulcer patients are hypersecretors but as will be shown later there are some who secrete at a normal rate (Table IV). Furthermore, there is accumulating evidence to show that the secretory pattern may vary in character and that while the parietal cell mass remains the accepted source of acid secretion, there is evidence to suggest that humeral stimuli predominate in certain subjects and nervous stimuli mediated by the vagus predominate in others.

Gillespie and Kay (1961) have shown that the response to maximal histamine stimulation varies quite considerably from patient to patient and that 'medical vagotomy' by the injection of hexamethonium bromide and atropine reduces the maximal histamine response to a variable degree. They infer from this that in certain subjects the hormonal stimuli are dominant and the control of acid secretion in this group depends not so much on vagotomy as on antrectomy.

Other factors beside the attack by acid secretion seem to influence the formation of peptic ulcer. It is generally accepted that gastric ulcer is not associated with hypersecretion and, as has already been pointed out, certain patients with duodenal ulcer secrete at normal and even subnormal rates. The defence mechanism, as well as the force of the attack, must be taken into account. These defensive elements are associated with secretion of mucus. Observations on gastric secretion suggest that a non-parietal component is present, probably secreted by the surface mucus cells and the mucus cells at the neck of the gastric glands. Furthermore, in addition to the secretion of a non-parietal component, epithelial cells of the gastric mucosa contain mucus and form an intracellular layer of mucus. These cells tend to be shed during digestion and are rapidly replaced, probably from the gastric pits. It seems likely, therefore, that any factor which interferes with the constant replenishment of the mucus lining of the

stomach and duodenum would favour ulcer formation (Johnson, 1957).

While peptic ulcer may be associated, and, in the case of duodenal ulcer, is most frequently associated with an attack by excessive secretion of acid, a breakdown of the defence mechanism may also contribute to the formation or persistence of ulcer even when this attack is weak. Further study of mucopolysaccharide secretion may lead to a more accurate assessment of this defence mechanism.

In planning surgical procedures for the cure of peptic ulceration one must consider whether in any particular subject the ulcer is due to a breakdown in the defence mechanism or to an overwhelming attack of acid secretion. Furthermore, if the findings of Gillespie and Kay (1961) are accepted, one must be prepared to differentiate between those in whom this attack is predominantly vagal in origin and those in whom vagal influences are minimal.

All forms of surgical attack on acid secretion, whether they depend on ablation of a major portion of the parietal cell mass by gastrectomy or on a drastic reduction of stimulation by vagotomy or antrectomy or a combination of these procedures, carry a series of side-effects which seem to affect only a minority of subjects. This suggests that in modern surgical practice a minority with a normal or small parietal cell mass are being subjected to a subtotal gastrectomy, removing much of a secretory element which they can ill afford to lose, while others who are by no means nervous hypersecretors are being subjected to ill-advised vagotomy, resulting in disturbances of intestinal motility.

DEVELOPMENT OF THE POLICY OF SELECTIVE SURGERY

INVESTIGATION Thirteen years ago a policy was developed in my surgical unit at the Preston Royal Infirmary, whereby each candidate for gastric surgery was investigated to assess his secretory pattern and vagal activity. No attempt so far has been made to estimate the gastric defence mechanism, but it is assumed that if an ulcer is present and the attack by acid is not excessive the defences must be weak. Alternatively it has been suggested that prolonged activity of the ulcer has led to gastritis with consequent reduction of the parietal cell mass (Schragar, 1961, personal communication).

In the early stages of the study, the total nocturnal secretion was collected from 9 p.m. to 9 a.m. and the volume and concentration of free and total acid estimated. This was followed by an insulin test meal. Patients showing an excess of free acid during nocturnal secretion were subjected to vagotomy combined with a hemigastrectomy. When the night

FIG. 1. Estimated mean nocturnal secretion for free HCl: a, in 15 controls; b, in 45 duodenal ulcer patients showing high level nocturnal secretion in most; c, in 25 duodenal ulcer patients after vagotomy without a drainage procedure showing marked overall fall in night secretion levels.

secretion was not excessive, vagotomy was omitted and hemigastrectomy alone performed.

Serious sources of error were encountered in this simple method of examination. It was difficult to ensure for instance that the Levine tube did not become blocked or curled up into the fundus of the stomach during the 12 hours of the nocturnal secretion test. More accurate methods had to be adopted and it became the rule to employ the maximal histamine response (M.H.R.) described by Kay (1953).

The basal hour reading is taken as an estimate of vagus activity, though other factors such as mucopolysaccharides and acid induced by posterior hypothalamic and adrenal stimulation undoubtedly contribute to basal secretion. Johnson and I (Fig. 1) have shown that there is a significant fall in night secretion of duodenal ulcer hypersecretors following vagotomy. The M.H.R. is considered to be a measure of the parietal cell mass but, as Gillespie and Kay have demonstrated, it is possible to differentiate between those subjects in whom the parietal cell mass is stimulated mainly by vagal activity and those in whom stimulation is mainly by hormone activity.

The routine now employed is as follows:—The patient fasts for 12 hours over night. A radio-opaque Levine tube is positioned under radiological control and an hour allowed for the patient to settle down. The resting juice is collected and discarded. Basal secretion is collected for one hour and the volume and concentration estimated. An injection of an antihistamine is given, followed by histamine 0.04 mg. per kilogram of body weight. Gastric secretion is collected into four 15-minute samples and the sum of the second and third samples (or the third and fourth samples, if larger) is recorded as the post-histamine 30-minute secretion of acid in milliequivalents of HCl.

EVALUATION OF SECRETORY RESPONSE The average secretory response in normal subjects is shown in Table III.

TABLE III
RANGE OF SECRETION FOUND IN
12 NORMAL CONTROLS

	Basal Hour (mEq. of HCl)	30 Minutes after Histamine (mEq. of HCl)
Females	1 ± 1	9 ± 3
Males	2 ± 1	12 ± 3

The response in subjects suffering from duodenal ulcer, while appreciably higher than that found in normal controls, has shown wide variation, as will be seen from Table IV. There is no close correlation between basal hour secretion and post-histamine secretion. In certain estimations the basal hour secretion has approached closely to the post-histamine 30 minutes' secretion, for example, in Nos. 3, 7, 12, and 28 in Table IV.

It is possible, therefore, to make a selective division of peptic ulcer patients into five groups:—

1 Those in whom basal secretion and M.H.R. are low (as applies in most gastric ulcer cases). In such patients it may be assumed that the ulcer is the result of a breakdown in the defence mechanism and an operation designed to by-pass or to excise the ulcer need not include any radical procedure to reduce acid secretion (Table V).

2 Those in whom basal secretion is normal or low, but in whom the M.H.R. is increased. In such patients it may be assumed that the parietal cell mass is greater than normal and that hormone stimulation is responsible for the hypersecretion. In such patients the pyloric antrum must be removed along with some of the parietal cell mass. This can be

TABLE IV

PRE-OPERATIVE HISTAMINE SECRETORY TESTS				
No.	Sex	Ulcer	Basal Hour Output (mEq.)	Post-histamine Maximum Output ($\frac{1}{2}$ hour in mEq.)
1	M	Duodenal	8.7	25.5
2	F	Duodenal	9.0	13.2
3	M	Duodenal	11.0	13.5
4	M	Duodenal	4.6	13.8
5	M	Duodenal	1.1	12.6
6	M	Duodenal	8.2	21.9
7	M	Duodenal	16.6	16.2
8	F	Duodenal	1.7	13.2
9	M	Duodenal	7.6	14.4
10	M	Duodenal	5.3	24.5
11	M	Duodenal	7.6	16.8
12	M	Duodenal	11.6	11.0
13	M	Duodenal	2.6	18.9
14	M	Duodenal	4.2	17.8
15	M	Duodenal	0.0	16.0
16	M	Duodenal	4.2	14.8
17	M	Duodenal	1.2	5.3
18	M	Duodenal	2.1	7.6
19	M	Duodenal	7.2	16.0
20	M	Duodenal	10.1	18.0
21	M	Duodenal	3.1	15.1
22	M	Duodenal	13.6	24.2
23	M	Duodenal	6.0	7.6
24	M	Duodenal	11.3	19.8
25	M	Duodenal	6.0	12.5
26	M	Duodenal	2.4	14.8
27	M	Duodenal	0.0	14.9
28	M	Duodenal	10.0	14.0
29	M	Gastric	1.3	2.6
30	M	Duodenal	0.0	3.2
31	F	Duodenal	0.0	8.7
32	M	Duodenal	6.7	15.6
33	M	Duodenal	15.0	17.4
34	M	Duodenal	2.7	16.4
35	M	Duodenal	3.9	20.8
36	M	Duodenal	1.1	8.5
37	M	Duodenal	0.0	19.4
38	M	Duodenal	3.1	11.5
39	M	Duodenal	7.8	8.8
40	M	Duodenal	0.6	23.7
41	F	Duodenal	6.0	19.4
42	M	Duodenal	0.3	2.8
43	M	Duodenal	1.8	25.5
44	M	Gastric	0.0	0.9
45	M	Duodenal	7.4	10.0
46	M	Duodenal	5.0	14.6
47	M	Duodenal	3.7	26.2
48	F	Gastric	6.1	11.2
49	M	Duodenal	3.8	20.0
50	M	Duodenal	5.0	13.1

TABLE V

EXAMPLES OF LOW SECRETORS			
Sex	Ulcer	Basal Hour Output (mEq./l. HCl)	M.H.R. Half Hour (mEq./l. HCl)
M	Gastric	1.3	2.6
M	Duodenal	1.2	5.3
M	Duodenal	2.1	7.6
F	Duodenal	0.0	8.7

TABLE VI

EXAMPLES OF LOW BASAL SECRETORS WITH RAISED M.H.R.			
Sex	Ulcer	Basal Hour Output (mEq./l. HCl)	M.H.R. Half Hour (mEq./l. HCl)
M	Duodenal	2.6	18.9
M	Duodenal	0.0	16.0
M	Duodenal	3.1	15.1
M	Duodenal	2.4	14.8
M	Duodenal	0.0	14.9

effected by a hemigastrectomy leaving an adequate gastric reservoir (Table VI).

3 Those patients (the majority of male duodenal ulcer patients) in whom the basal secretion is raised and the M.H.R. is also raised. In such patients it may be assumed that the parietal cell mass is in excess and that vagal as well as hormone activity plays a part in stimulation. In such patients a vagotomy combined with hemigastrectomy is adequate (Table VII).

TABLE VII

EXAMPLES OF RAISED BASAL SECRETORS AND RAISED M.H.R.			
Sex	Ulcer	Basal Hour Output (mEq./l. HCl)	M.H.R. Half Hour (mEq./l. HCl)
F	Duodenal	9.0	13.2
M	Duodenal	11.0	13.5
M	Duodenal	8.2	21.9
M	Duodenal	11.3	19.8

4 Those in whom basal secretion is very high (10 to 20 mEq.) but the M.H.R. is not proportionately excessive. These may be assumed to have a normal parietal cell mass, but the stimulation is continuous and predominantly vagal, and a vagotomy and a drainage procedure might be expected to bring about healing of the ulcer and protection against recurrence. In women a vagotomy and gastroenterostomy, and in young males in whom the ulcer is very small and there is no oedema or distortion of the duodenum, a vagotomy and pyloroplasty would be the operations chosen (Table VIII). In this small group the possibility of the Zollinger-Ellison syndrome must be considered.

TABLE VIII

EXAMPLES OF EXCESSIVE BASAL SECRETORS WITH M.H.R. NOT PROPORTIONATELY RAISED			
Sex	Ulcer	Basal Hour Output (mEq./l. HCl)	M.H.R. Half Hour (mEq./l. HCl)
M	Duodenal	11.0	13.5
M	Duodenal	16.6	16.6
M	Duodenal	11.6	11.0
M	Duodenal	10.0	14.0

5 Those in whom basal secretion is very high and the M.H.R. is also excessive. One must assume a greatly increased parietal cell mass stimulated by vagal and hormone stimuli, and a vagotomy combined with a two-thirds or even in exceptional cases a three-quarters gastrectomy is essential to reduce the parietal cell mass to safe proportions and protect against recurrence (Table IX).

TABLE IX

EXAMPLES OF EXCESSIVE BASAL SECRETORS ASSOCIATED WITH EXCESSIVE M.H.R.

Sex	Ulcer	Basal Hour Output (mEq./l. HCl)	M.H.R. Half Hour (mEq./l. HCl)
M	Duodenal	8.7	25.5
M	Duodenal	5.3	24.5
M	Duodenal	13.6	24.2

DISCUSSION

The factors which have influenced the surgeon in his choice of an operation for peptic ulcer have completely changed at least three times in the present century. During the first 20 years, when open ether or chloroform anaesthesia was routinely employed, the immediate operative mortality from gastric surgery gave cause for concern and simple procedures such as gastro-enterostomy and wedge excision of gastric ulcers were preferred to the more hazardous gastrectomy techniques. The second 20 years saw a swing towards more and more radical procedures as the growing danger of stomal ulcer became appreciated. During the last 20 years death rates have fallen and stomal ulcers have become less frequent, but surgical judgment has become clouded by the prevalence and severity of post-gastrectomy side-effects. The swing of the pendulum is all towards less radical procedures, of which vagotomy is the most important, but during the last two years the side-effects of vagotomy have caused concern. A re-appraisal of the position is required before the pendulum swings again.

The fallacy which has dominated the thinking of surgeons in relation to peptic ulcer during the last 60 years is that all duodenal ulcers present the same problems and that all gastric ulcers can be considered together and treated by a common procedure. The secretory studies presented here demonstrate the wide variation in secretory pattern and the inadvisability of accepting one routine procedure for all patients. In a small proportion only, the danger of stomal ulceration must take precedence over all other considerations but in the majority the primary consideration is to render the patient comfortable and happy, not only free from the pains, perforations,

and haemorrhages attendant upon his ulcer, but free from dumping, diarrhoea, biliary vomiting, and anaemia attendant on his operation.

A surprising feature of this study has been the number of male patients with duodenal ulcer who have failed to fall into the hypersecretory pattern. Whether these patients represent a group wherein the ulcer is due to a breakdown in the normal defence mechanism which has failed to withstand an attack by a minimal acid secretion or whether, as seems more likely, long-standing ulceration has led to gastritis with consequent destruction of the parietal cell mass, is a problem requiring further study. There is strong evidence to support the view that the low acid secretion commonly associated with gastric ulcer is associated with gastritis, but whether this is true also for duodenal ulcer is not yet clear. One further point to be considered in this connexion is whether, if gastritis follows long-standing ulcer, the condition is reversible? When the ulcer is removed will the gastritis subside and the parietal cell mass regenerate? If this can happen, is one justified in treating a low secretor by less radical methods?

The conclusion to be drawn from these studies is that it is justifiable to employ less radical methods in such cases. Details of the follow-up survey of a series of 1,502 ulcer patients treated in my wards over a 12-year period by the policy of selective surgery are recorded in Tables X, XI, and XII. Five points stand out which seem to justify the policy.

- 1 The overall mortality rate is 1.3%.
- 2 The incidence of stomal ulcer is 0.73%.
- 3 Eight per cent were classified as unsatisfactory but after treatment this unsatisfactory group fell to 3%.
- 4 The small stomach syndrome was seldom encountered as, except in gross hypersecretors, a hemigastrectomy was performed in preference to a subtotal resection. The majority of the unsatisfactory results were due to mechanical faults related to the afferent loop. As experience ripened methods were devised to reduce this hazard.

5 Post-vagotomy diarrhoea was rarely seen and only in a minor degree. This is attributed to the fact that only those who exhibited overactivity of vagal stimulation were subjected to vagotomy. The only three patients who complained of troublesome diarrhoea were patients on whom a vagotomy had been performed without secretory evidence of overactivity of the vagus.

There was a steady improvement in results throughout the years as the selective technique became better established, and the importance of leaving an adequate gastric reservoir with a slow-emptying small stoma was appreciated. The adoption

TABLE X
RESULTS OF OPERATION

Operation	Male					Female					Total	Percentage of Initially Poor Results ^a	Percentage of Final Poor Results of Treatment
	Category					Category							
	I	II	IIA	III	IV	I	II	IIA	III	IV			
Duodenal Ulcer ¹													
Vagotomy alone	9	6	0	1	0	0	0	0	0	0	16		
Partial gastrectomy	216	90	14	3	2	41	9	10	0	1	386	7.7	1.5
Vagotomy and partial gastrectomy	309	109	26	3	0	18	15	4	1	1	486	7.2	1.0
Gastro-enterostomy	32	61	2	1	0	29	20	1	1	1	93	6.5	3.2
Vagotomy and gastro-enterostomy	16	4	0	0	0	8	5	0	0	0	33	0.0	0.0
Bancroft's procedure	25	3	0	6	0	0	1	0	0	0	35	17.1	17.1
Billroth I	29	13	1	1	2	10	7	0	0	1	64	7.8	6.2
Vagotomy and pyloroplasty	6	3	0	0	2	1	1	0	0	0	13		
Total	642	234	43	15	6	107	58	15	2	4		10.4	2.3
Gastric Ulcer													
Vagotomy alone	2	2	0	1	0	0	0	0	0	0	5		
Partial gastrectomy	45	22	3	2	0	13	6	1	0	0	92	6.5	2.1
Vagotomy and partial gastrectomy	16	6	0	0	0	2	0	0	0	0	24	0.0	0.0
Billroth I	115	24	7	5	0	53	16	5	2	0	227	8.3	3.0
Total	278	54	10	8	0	68	22	6	2	0		7.5	2.9
Category totals	790	343	53	23	4	175	80	21	4	4		7.7	2.4
Total	1,464												
Category I	Excellent					} satisfactory result							
Category II	Good with minor complaints												
Category IIA	Complaints relieved by revision operation					} poor result							
Category III	Complaints but at full work												
Category IV	Disabling complaints												

¹For simplicity, operations for stomal ulcer and combined duodenal and gastric ulcer have been included in the duodenal ulcer group.

^aPercentage calculations have been omitted where the numbers have been too small to have significance.

TABLE XI
DEATHS AFTER ELECTIVE SURGERY

Lesion	Male Post-operative			Female Post-operative		
	First 5-Year Series	Second 5-Year Series	Last 2-Year Series	First 5-Year Series	Second 5-Year Series	Last 2-Year Series
Duodenal ulcer	7	4	1	0	0	0
Gastric ulcer	4	2	0	0	1	0
Duodenal and gastric ulcer	0	0	0	0	1	0
Stomal ulcer	0	0	0	0	0	0
Total	11	6	1	0	2	0

First five years, 11 = 1.7% Second five years, 8 = 1.2% Final two years, 1 = 0.5%.

The total number of post-operative deaths is 20 = 1.3% mortality rate.

The total number of later deaths from other causes is 110.

There are 18 lost to follow-up.

There are 1,464 followed-up.

TABLE XII
STOMAL ULCERS AFTER OPERATIONS IN THIS SERIES

Primary Operation	Male	Female	Pre-operative Secretory Test Misleading	Pre-operative Secretory Test Omitted	Revision Operation	Present Category
Posterior gastro-enterostomy	0	2	0	2	Partial gastrectomy and vagotomy	I & III
Posterior gastro-enterostomy and vagotomy	1	0	1	0	Partial gastrectomy	I
Partial gastrectomy	2	2	0	3	Vagotomy	I, I, I, I
Billroth I	2	0	0	2	Partial gastrectomy	I, I
Partial gastrectomy and vagotomy ¹	2	0	0	0	Transthoracic vagotomy	I, III

Total, 11 cases = 0.73% of total

¹Post-operative insulin test demonstrated incomplete vagotomy in one case.

Second case ulcer suspected but not proven.

of a retro-colic stoma at the duodeno-jejunal junction virtually abolished afferent loop troubles.

As this policy has been in operation for 13 years it is reasonable to assume that it is standing the test of time. More accurate methods of assessing secretory activity by transistors may be expected to lead to further improvement, but there is no reason for another swing of the pendulum. The methods which have proved effective in the past are, with modification, effective still. The secret is to choose the right patient and give him the right operation for his particular needs.

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