BACK TO BILLROTH I

A COMPARISON OF RESULTS OF BILLROTH I AND II OPERATIONS

BY

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More than a million people in these islands are denied the pleasure of the table for weeks or months or years at a time owing to peptic ulcer. The most frequent sufferer is the breadwinner of the family, and as the pit of his stomach grows heavy his purse grows light, his face long, and his temper short, until in time the whole family comes to feel the strain of father's ulcer. This miserable "pre-gastrectomy syndrome" can be exchanged for a life of domestic and epicurean bliss, up to the levels permitted by political expediency, for most of these medical sufferers by well-planned, old-established, and adequately performed surgery. This happy "post-gastrectomy syndrome," which can be at times for the "ninety and nine," is too often forgotten in the quest of the unfortunate "one."

Much attention has been given to features arising after gastrectomy and labelled "post-gastrectomy syndrome," as if they were a customary expectation following partial gastrectomy. Perhaps a better description of what is implied would be "post-Polya-gastrectomy syndrome."

A great volume of work has been published on the late results of gastrectomy for benign ulcer, and, as fresh complications after the Polya procedure have been brought to light, loops have been passed for a time from right to left then back again, made antecolic then retrocolic, made long then short, then long again. "Valves" also have had an equally unsettled existence. In the past decade attempts were made to clarify these issues by accurate measurement of long-term results, "dumping" was born, and later came the after-birth of "early and late syndromes." Most of the analyses have been on the results of some modification of the Billroth II operation, whether it be the Polya or a "valve" with a disputed, unpronounceable title. This state of affairs is largely due to the Polya operation having been made fashionable, partly because of the comparative ease with which it can be performed, and partly by the untested faith of those early zealots who first gave it to us. There have been few reports on post-operative studies of series of Billroth I gastrectomies, and still fewer on a comparison of results of the various methods.

Capper and Butler (1951), in assessing 102 patients treated by the Billroth I method, compared these with several groups of about the same number treated by varieties of the Polya-type gastrectomy, and they found no patients with early post-gastrectomy syndrome in the Billroth I group as against 12-15% in each Polya-type group.

Wells and Brewer (1948) say they found no dumping in 363 cases, mostly of the Polya type, but Wells and Welbourn (1951), in what is mostly an excellent review, claim enough experience to be able to write about it. They state that the Billroth I operation is technically difficult in duodenal ulcer and that ulcers are apt to recur. They referred to Wells and Brewer (1948) for

evidence, but Wells and Brewer claim only 24 patients treated by the Billroth I technique. Further, they say it is likely that their deductions are false, as in most of the examples of the Billroth I operation which they quote the resection of the stomach was inadequate. There is no sound evidence here.

On the other hand, Schoemaker (1947), in 129 patients with peptic ulcer (40 gastric and 89 duodenal), used his own modification of Billroth I in 111 patients without any instances of dumping in the follow-up.

Custer, Butt, and Waugh (1946), at the Mayo Clinic, say that they did not find dumping in the cases treated by the Schoemaker modification of the Billroth I, but they had a high incidence of dumping in those who had undergone the posterior Polya anastomosis. They say it follows gastric resection of the latter type in 5-12% of cases and is apt to be permanent.

In a comparison of results there is no sound evidence against the Billroth I procedure, but there is some solid evidence for it. There is much sound evidence against the Polya types of anastomosis.

Mortality

My personal experience of Billroth I and Polya operations for benign ulcer to the end of 1952 is: Billroth I, 193 operations (gastric 93, duodenal 100); Polya, 89 operations (gastric 16, duodenal 73). The proportion of Polya operations is much higher than I would now advise or find necessary. The mortality of these operations is as follows:

Billroth I Series (193).—(a) Elective operations (162)—1 died. Post-mortem examination: a wasted man of 69 explored on the suspicion of carcinoma and dying of bronchopneumonia. (b) Emergency operations for bleeding (31)—3 died. Post-mortem examination: (i) coronary thrombosis; (ii) massive pulmonary embolism; (iii) leakage of suture line.

Polya Series (89).—(a) Elective operations (82)—3 died. Post-mortem examination: (i) a man of 73 operated on for pyloric stenosis died of bilateral suprarenal haemorrhage; (ii) a man of 45 operated on for duodenal ulcer died of inhalation pneumonia; (iii) a man of 57 operated on for duodenal ulcer died from leakage at the duodenal stump. (b) Emergency operations (7)—1 died. Post-mortem examination: a woman of 57 operated on for a huge duodenal ulcer with uncontrolled bleeding died from rupture of a posterior perigastric abscess with no good evidence of leakage.

The mortality for all elective operations was 4 deaths in 244 resections, and for all emergency operations for acute bleeding 4 deaths in 38 resections.

The safety of the Billroth I operation has been questioned at times on the grounds of a high incidence of leakage at the so-called "danger angle," where the reconstituted lesser curve meets the gastro-duodenal suture line. In this series there was no evidence of leakage in 162 elective operations, and in 31 emergency operations the only instance occurred in a woman of 84 with acute haematemesis who developed the signs of a leak on the sixth day after operation following removal of the aspiration tube on the fifth day. The post-mortem examination showed poor healing reaction and a leakage at the danger angle. Fluid had accumulated in the stomach and the resulting drag had caused the sutures to cut through the tissues in the absence of support by natural healing. The debilitated 84-year-old patient often heals poorly.

On this evidence it would be fair to say that the results of the Billroth I operation from the surgical aspect of the resection and anastomosis are almost devoid of mortality.

In the Polya series there was one instance of leakage at the Achilles heel, the duodenal stump. This operation is equally safe in accustomed hands, as shown by Hosford (1949), who had 1 death in 200 elective operations, com-

pared with 1 death in 162 elective operations by Billroth I technique in my series. So there is no evidence of any significant difference in the relative safety of either operation when properly performed, and the relative merits must be judged by the degree of sequelae.

Morbidity

It was my impression that the patients on whom I had performed a Billroth I gastrectomy were not showing the dumping syndrome, nor were a proportion wasting as were some of those patients who had had a Polya gastrectomy. It was to confirm this impression that this analysis was made.

The patients in this study total 154, and were those on whom I had performed a partial gastrectomy for benign ulcer in the public ward of the Radcliffe Infirmary or the Churchill Hospital before the end of 1951. Private operations and those done elsewhere were not included, nor were patients on whom vagotomy was added to partial gastrectomy. The review was 94% complete. The interviews were made in the out-patient department by my medical colleague, Dr. E. M. Buzzard, and by myself. Both the type of ulcer and of operation were unknown to Dr. Buzzard, and many I could not recall. All results were assessed and tabulated before examining the case notes for the nature of the ulcer and of the operation. The analysis was done under the headings of weight, various symptomatic complaints, and assessment of the result, which was made independently by both of us; and, further, I asked every patient to give his frank opinion of what he thought about the result of the operation. These broad assessments have been classified individually. We have not drawn a distinction between the effects that came on early or late after meals, a simple tally being made of all the symptoms. The worst picture has been painted, as all symptoms have been totalled whether recorded by one or both of us. For ease of reading the discussion of symptoms is done under each separate heading.

General Features

Total patients examined—154 (19 female, 135 male). Ages—the usual large group between 40 and 60 years, 9 below 30, 8 over 70, and 4 over 80.

Varieties of ulcer—62 gastric, 86 duodenal, and 5 stomal, 1 in which no ulcer was found at operation. Multiple ulcers were found in 10% of patients, the more severe ulcer being the one used for subsequent classification.

Operations—Billroth I, 98 (49 for gastric and 49 for duodenal ulcer); Polya, 56 (13 for gastric, 37 for duodenal, and 5 for stomal ulcer).

TABLE I.—Weights

Years:	0-1		1-2		2-3		3+		Total for All Years	
	BI	P	BI	P	BI	P	BI	P	BI	P
Same	29	—	19	2	10	6	9	13	67	21
+7 lb. 3.2 kg.	—	—	4	1	—	2	2	4	9	7
+14 " 6.4 kg.	—	—	4	—	—	—	—	—	4	—
+21 " 9.5 kg.	3	1	4	—	—	—	1	1	8	2
-7 " "	3	—	4	5	1	6	1	4	9	15
-14 " "	—	—	1	1	—	4	—	4	1	9
-21 " "	—	—	—	—	—	1	—	1	—	2
Total	38	1	36	9	11	19	13	27	98	56

BI=Billroth I. P=Polya.

Weights were assessed as nearly as possible by taking the patient's opinion of the usual weight, and weight a year pre-operative and immediately pre-operative. These were all checked so far as possible against information taken from notes. An assessment was made from these data of the likely normal weight in the past year or two, and the weight found at interview was compared with it. A return of weight to normal following a loss during operative treatment was not accepted as a gain in weight for the present purpose,

nor was it regarded as a loss when there was reduction of fatty tissue after operation in a patient made overweight by a recent milky diet. Gains or losses up to 6 lb. were classed as "same," 7 to 13 lb. were classed as + or -7 lb., 14 to 20 lb. were + or -14 lb. A fair amount of latitude must be allowed in consideration of weight owing to difference of clothes and the slight seasonal alterations, and it was thought that one must allow 6 lb. for such changes.

It will be seen from Table I that in the Polya series quite a high proportion of patients showed a weight loss. The Billroth I series shows only nine patients with a loss of 7 lb., which is not a very significant loss when such factors as clothes, seasonal changes, and change of work are concerned.

The Billroth I series shows only a 1% loss of 7 lb. or more, whereas the Polya series shows a 20% loss of 7 lb. or more.

Others have noticed this weight loss with the Polya type. Muir (1949) showed that of 86 patients submitted to Polya gastrectomy and examined at intervals of six months to six years after operation, over 40% had lost 7 lb. or more and over 20% had lost over 14 lb. or more. Only 10% of patients had gained weight. This led Muir to comment, "Further investigation of this important abnormality in gastrectomized patients is obviously required." Among my cases 16% of the Polya series, in contrast to 22% of the Billroth I series, showed a gain in weight. Ward-McQuaid (1949) showed that of 49 patients operated on by Mr. Elliot Smith, 24 (50%) were 7 lb or more below normal weight one to two and a half years after the Polya operation, 15 (32%) had lost 14 lb. or more, and only 4 had gained weight.

These findings support the general impression I had formed when seeing patients after operation, that the Billroth I series had not lost weight to the degree seen in the Polya series. The loss or gain of weight is not obviously associated with any functional upset, but it is often a nuisance or an embarrassment to patients, who complain of being too thin or having to buy new suits of clothes. The maintenance of weight in the Billroth I series may be due to better mixing of food, bile, and pancreatic juices as the food passes into the duodenum, and the loss in the Polya series may be due to imperfect mixing, with perhaps a loss of bile from bilious vomiting, which is often a feature in the Polya-type case. But those who have lost weight after a Polya-type operation are not always those who have bilious vomiting. The maintenance of weight in the Billroth-I-type case is not in this series due to inadequate resection of the stomach, as is shown by the large number of Billroth-I-type patients with a reduced capacity for food in the first two years (Table IV). This finding of maintenance of weight in Billroth-I-type patients has not been brought to light before to my knowledge, and will need investigation in series by other surgeons before it can be adequately substantiated.

Symptomatic Complaints

Flatulence is a difficult symptom to assess from a patient, and must depend partly on how much air he swallows. There is no evidence in Table II of any essential difference between the Billroth I and the Polya series.

TABLE II.—Flatulence

	Billroth I				Polya			
	No.	+	++	+++	No.	+	++	+++
Gastric	49	4	1	0	13	2	0	0
Duodenal	49	2	2	0	43	2	7	1
Total	98	6	3	0	56	4	7	1

Analysis of these symptoms in years after operation: Billroth I, 0-2 years, 4 (74); 2+ years, 5 (24). Polya, 0-2 years, 2 (10); 2+ years, 10 (46).

Regurgitation of bile occurred in the Billroth I cases in the early post-operative period, but not in those operated on two or more years before. In the Polya series, however,

the proportion is high in those operated on two or more years before (Table III). The demonstration of this feature is not new, the tendency for the patient with the Polya type of operation to bring up bile even years after operation has been well shown in various papers. There has been much talk of "afferent loops."

TABLE III.—*Regurgitation of Bile*

	Billroth I				Polya			
	No.	+	++	+++	No.	+	++	+++
Gastric ..	49	3	—	—	13	3	—	—
Duodenal ..	49	2	1	—	43	8	—	—
Total ..	98	5	1	—	56	11	—	—

Analysis of these symptoms in years after operation: Billroth I, 0-2 years, 6 (74); 2+ years, 0 (24). Polya, 0-2 years, 1 (10); 2+ years, 10 (46).

All complaints of a reduced capacity to take food or liquids, especially with the main meal, are included in Table IV. These tend to lessen in the Billroth I series, but nearly half of those in the Polya series show real difficulty with food and liquids after two years.

TABLE IV.—*Reduced Capacity*

	Billroth I				Polya			
	No.	+	++	+++	No.	+	++	+++
Gastric ..	49	16	—	—	13	3	1	—
Duodenal ..	49	12	2	—	43	9	3	2
Total ..	98	28	2	—	56	12	4	2

Analysis of these symptoms in years after operation: Billroth I, 0-2 years, 25 (74); 2+ years, 5 (24). Polya, 0-2 years, 2 (10); 2+ years, 16 (46).

Table V shows a clear preponderance of persistent trouble with the Polya series and an entire absence of symptoms with the Billroth I patients after two years.

TABLE V.—*Puddings Produce Unpleasant Symptoms*

	Billroth I				Polya			
	No.	+	++	+++	No.	+	++	+++
Gastric ..	49	2	—	—	13	3	—	—
Duodenal ..	49	—	—	—	43	6	2	3
Total ..	98	2	—	—	56	9	2	3

Analysis of these symptoms in years after operation: Billroth I, 0-2 years, 2 (74); 2+ years, 0 (24). Polya, 0-2 years, 2 (10); 2+ years, 12 (46).

TABLE VIII.—*Personal Assessment of Results*

Years	Gastric Ulcer					Duodenal Ulcer					Totals for G.U. and D.U.	Percentage Distri- bution	Grand Total
	0-1	1-2	2-3	3+	Total	0-1	1-2	2-3	3+	Total			
	BI P	BI P	BI P	BI P	BI P	BI P	BI P	BI P	BI P	BI P			
By G. E. Moloney													
E	6 —	8 3	8 1	5 2	27 6	10 —	14 3	— 6	4 13	28 22	55 28	56 50	83
VG	5 —	5 2	1 —	1 2	12 4	8 1	3 —	— 5	— 5	11 11	23 15	23 27	38
G	5 —	1 —	1 —	— 1	7 1	4 —	4 —	— 4	1 3	9 7	16 8	16 14	24
I	— —	— 1	— 1	1 —	1 2	— —	1 —	— 1	— —	1 1	2 3	2 5	5
NI	— —	— —	— —	— —	— —	— —	— —	— 1	— 1	— 1	— 1	0 2	1
RU	— —	— —	1 —	1 —	2 —	— —	— —	— 1	— —	— 1	2 1	2 2	3
By Dr. E. M. Buzzard													
E	6 —	8 2	8 —	6 3	28 5	5 1	13 2	— 9	3 14	21 26	49 31	50 55	80
VG	5 —	4 2	1 —	— —	10 2	13 —	4 1	— 4	— 3	17 8	27 10	28 18	37
G	5 —	2 1	— 1	— 1	7 3	3 —	5 —	— 2	1 4	9 6	16 9	16 16	25
I	— —	— 1	1 1	1 1	2 3	1 —	— —	— 1	1 1	2 2	4 5	4 9	9
NI	— —	— —	— —	— —	— —	— —	— —	— —	— —	— —	— —	0 0	—
RU	— —	— —	1 —	1 —	2 —	— —	— —	— 1	— —	— 1	2 1	2 2	3
By the Patients													
V	7 —	12 4	8 1	6 2	33 7	15 1	15 2	— 12	4 17	34 32	67 39	68 70	106
GG	5 —	2 —	2 —	— 2	9 2	4 —	4 1	— 2	— 3	8 6	17 8	17 14	25
I	4 —	— 1	— —	— 1	4 2	3 —	3 —	— 1	1 —	7 1	11 3	11 5	14
NI	— —	— 1	— —	— 1	1 1	— —	— —	— 1	— 1	— 2	1 3	1 5	4
RI	— —	— —	— 1	— —	— 1	— —	— —	— —	— 1	— 1	— 1	0 4	2
EU	— —	— —	1 —	1 —	2 —	— —	— —	— 1	— —	— 1	2 1	2 2	3

E=Excellent. VG=Very good. G=Good. I=Improved. NI=Not improved. RU=Recurrent ulcer.

Table VI reveals nothing significant except a low incidence of sweating.

TABLE VI.—*Sweating*

	Billroth I				Polya			
	No.	+	++	+++	No.	+	++	+++
Gastric ..	49	1	—	—	13	1	—	—
Duodenal ..	49	1	—	—	43	1	—	—
Total ..	98	2	—	—	56	2	—	—

Analysis of these symptoms in years after operation: Billroth I, 0-2 years, 2 (74); 2+ years, 0 (24). Polya, 0-2 years, 0 (10); 2+ years, 2 (46).

Table VII suggests a remission of dizziness and sleepiness in the Billroth I series, but a strong persistence and high incidence in the Polya series.

There were two instances of anaemia, both in women who had had Billroth I operations for gastric ulcer. There was one instance of stomatitis and glossitis, in a man who had had a Polya operation for duodenal ulcer. The comparison of patients with gastric and duodenal ulcers shows no significant difference in either series.

TABLE VII.—*Dizziness and Sleepiness*

	Billroth I				Polya			
	No.	+	++	+++	No.	+	++	+++
Gastric ..	49	2	—	—	13	3	—	—
Duodenal ..	49	2	—	—	43	6	—	2
Total ..	98	4	—	—	56	9	—	2

Analysis of these symptoms in years after operation: Billroth I, 0-2 years, 4 (74); 2+ years, 0 (24). Polya, 0-2 years, 2 (10); 2+ years, 9 (46).

The Billroth I series had mild effects from a small stomach for a variable time, but after one to two years most patients develop a satisfactory capacity with few, if any, side-effects. The Polya series, on the other hand, show a proportion with persistence of bile regurgitation, unpleasant symptoms with puddings, reduced capacity for food and liquids, and dizziness and sleepiness after meals.

Perhaps there were not the same troubles when protein was plentiful, and a beefsteak with Yorkshire pudding in the afferent loop may not have been as productive of rising bile or sleepiness as is Yorkshire pudding without the beefsteak. But as we cannot forecast certain dietary problems it would seem best to let the jejunum keep the natural 12 in. (30 cm.) or so from the stomach as often as is possible.

Personal Assessment of Results

An assessment was made separately by Dr. E. M. Buzzard, myself, and the patients (Table VIII). The results were grouped into six categories—excellent, very good, good, improved, not improved, and recurrent ulceration.

Personal judgments vary, but it will be seen that the physician and the surgeon largely agree in essentials. It will also be seen that the "customer" was the most satisfied of all, and the contrast between his reckoning and ours shows that in many cases in which we see some defect the patient thinks nothing of it in his happiness at being able to eat when and what he likes, and at having no subsequent pain. With the exclusion of two patients with recurrent ulcers there was only one patient in the Billroth I group (98 patients) who classed herself as "improved," and none considered they were "not improved." In the Polya group (56 patients), three patients classified themselves as "improved," and two as "not improved."

Recurrent Ulceration

There were two patients with recurrent ulceration in the Billroth I series, both being after operations for gastric ulcer. One came on 51 months and the other 22 months after the original operation. Both these patients have been reoperated on, the procedure being excision of the ulcer, further reduction in the size of the stomach, vagotomy, and then reconstitution by Billroth I anastomosis. The second operations were done less than a year ago and the patients have had no further digestive upsets. There was one recurrent ulcer following a Polya operation for a duodenal ulcer.

Much has been written of the recurrence rate following the Polya operation, but the literature is surprisingly quiet on the recurrence rate for the Billroth I operation. The only reliable statistics are those of Schoemaker (1947), who reviewed 94 patients, all at an interval of more than three years after operation, and found two instances of recurrent ulceration. This compares with my recurrence rate of 2%. There is certainly no real evidence to show that the Billroth I operation is more productive of recurrent ulceration than is the Polya operation.

It would be a pity if in zeal to produce no instance of recurrent ulceration the philosophy of the late Hedley Visick (1948) was generally adopted. He claimed that by removing the greater part of the stomach, more than three-quarters, and anastomosing the jejunum to the remnant, he found no subsequent recurrent ulceration. With the whole stomach removed it would also be likely that there would be no recurrent ulceration, but after the very radical type of operation which Visick recommended one must expect to see in high numbers such sequelae as bilious vomiting, reduced capacity for food, weight loss, and other unpleasant features. It is better, I submit, to treat 100 cases by less radical measures, such as the Billroth I operation, and to secure a good functional result for 98. If two should later prove themselves by re-ulceration to be the black sheep, only those need be given a near-total clipping of the offending organ to be rid of pain at the price of possible unpleasant sequelae.

Discussion

The main inference from these results is that the Billroth I operation should be used wherever possible for the surgical treatment of gastric and duodenal ulcers. There is a strong swing back to the Billroth I operation for treating gastric ulcer, but, owing to what may be unhappiness in the dissection of the difficult duodenal ulcer, the Polya operation is so often considered to be more suitable for dealing with a duodenal ulcer, and the devil take the post-operative consequences.

I find that most duodenal ulcers can be dissected out with patience and care, though it is not advisable if they are far distal in the second part of the duodenum near the opening

of the bile duct. I use the Billroth I operation for duodenal ulcers as often as I can, as I believe there is a better post-operative result. One must expect a proportion of difficult dissections, but once the duodenum is freed beyond the ulcer it is well to remember that if there is enough to close there is enough to anastomose, and one might as well do a Billroth I. In the past two years I performed the Billroth I operation for 50 gastric ulcers and 78 duodenal ulcers, while the Polya operation was done for 3 patients only, all with distal duodenal ulcers.

In the past 18 months I have been endeavouring to overcome the reduced capacity, especially for the main meal, owing to the small stomach remnant. This is seen in the early months after the operation, but greatly improves later. Men under 50 are usually more vigorous, needing a bigger food intake, and in these I have been leaving nearly half the stomach, adding vagotomy in those with duodenal ulcer. This is not done in order to achieve an anastomosis, for high resection with gastro-duodenal anastomosis can be achieved after resection of a duodenal ulcer. My theory is that a Billroth I procedure gives more than the equivalent of a pyloroplasty, for it means a fresh start without the ulcer. The removal of the lower half of the stomach takes away that great stimulator of gastric juice, the mucosa of the pyloric antrum, and the vagotomy reduces the secretory capacity of the remaining mucosa; thus humoral and nervous mechanisms of secretion are both eliminated. As half the stomach is removed the incomplete emptying found with vagotomy alone is unlikely to occur. So much for the theory. In practice it has been working well, judging by impressions, but the results have not yet been subjected to time or detailed analysis, nor have the numbers been sufficient. This must therefore remain an interim investigation.

Summary

The results of a series of 154 operations for varieties of peptic ulcer by Billroth-I-type and Polya-type techniques are contrasted.

The main findings are that the patients after a Billroth I gastrectomy do not lose weight in an abnormal way like some of those who have had a Polya gastrectomy.

After Billroth-I-type gastrectomy patients showed few distressing symptoms after meals, and such unpleasant features as there were tended to wear off with the passage of time, in contrast to a persistence of those following Polya-type gastrectomies.

The incidence of recurrent ulcer is the same in both series (2%), and it is claimed that there is no real evidence of a difference in recurrence rate between the two methods.

A plea is made for avoiding too radical resection of the stomach, which may eliminate recurrent ulcer but cause unpleasant post-operative sequelae.

Mention is made of a method on trial for improving the reduced stomach capacity found at times in the early months after operation.

I thank Dr. E. M. Buzzard for giving so much time and effort as an independent judge in this assessment.

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