

The Long-term Outcome of Billroth I Partial Gastrectomy for Benign Gastric Ulcer

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A study was done of 144 patients undergoing Billroth I partial gastrectomy for benign gastric ulcer. At a mean follow-up of 9.4 years, 95 patients were alive. Of 79 patients reviewed, 84% had an excellent or good result on clinical (Visick) grading. Five cases of proven recurrent ulceration were found; two of these patients required subsequent truncal vagotomy. There was one early death after operation, and 48 late deaths, including one from carcinoma of the gastric remnant (at two years), one from a reticulum cell sarcoma of the stomach (at three years), and one from reactivation of pulmonary tuberculosis. The operation was not attended by appreciable nutritional sequelae, although there was a tendency towards iron deficiency anemia.

and histopathology records. Data concerning the presentation and operative treatment of these patients were retrieved from case records, many of which had been preserved on microfilm.

ONE HUNDRED YEARS HAVE ELAPSED since Billroth (1881)¹ performed the first successful partial gastrectomy for carcinoma, and Rydygier (1882)² adopted the procedure for benign ulceration. Despite brisk initial controversy, Billroth I partial gastrectomy has become the standard procedure for benign gastric ulcer. During recent years a tendency has developed towards more conservative operations for gastric ulcer, such as truncal vagotomy and drainage,³⁻⁷ or highly selective vagotomy with or without local resection of the ulcer.⁸⁻¹⁰ The aim of these conservative procedures is to avoid the adverse clinical, biochemical, and hematologic sequelae of gastric resection. The present study was devised to determine the prevalence of such sequelae in long-term survivors of a standard Billroth I partial gastrectomy for benign gastric ulcer.

At follow-up 95 patients (66%) were alive, and 68 of these were recalled for symptomatic review, physical examination, chest x-ray, and biochemical and hematologic screening. Another 11 patients replied to a postal questionnaire, and 49 patients had died, leaving 16 (11%) who could not be traced.

At interview, each patient's symptoms were assessed and graded according to a modified Visick scale^{11,12}; physical examination and measurement of the patient's weight were also undertaken. Any recurrent dyspeptic symptoms were investigated by barium meal and/or endoscopy. Of those patients who had died, details of their progress after operation were ascertained from the hospital notes, together with the cause of death. In many cases, this information was supplemented by inquiry of the patient's general practitioner. Several patients had left the district, and in some of these the cause of death was obtained from the Office of Population Consensus and Surveys.

Patients and Methods

A consecutive series of 144 patients at the Bristol Royal Infirmary was studied, including 83 males and 61 females. Patients had undergone Billroth I partial gastrectomy for benign gastric ulcer between 1965 and 1975. To make the survey as comprehensive as possible, details of these patients were obtained from three separate sources: hospital notes, operating theater books,

Results

These 144 patients had a mean age of 58.5 years (range 26-86) and a mean length of history of 7.0 years (SD \pm 7.4). There was no significant difference in the distribution of major blood groups between the population studied and a normal population,¹³ but 80% of ulcer patients were smokers. Pain was the most common presenting symptom (85%), often accompanied by vomiting (48%) and weight loss (45%). Forty-five patients underwent emergency surgery, 39 for bleeding and 6 for perforation. Gastric resection was recorded as 75% or more in 19 cases (13.2%) and 30% or less in 8 cases

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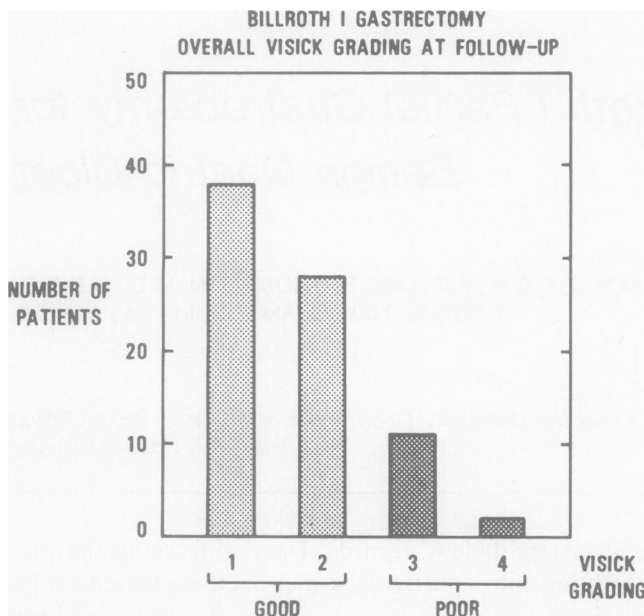


FIG. 1. Overall Visick grading at follow-up.

(5.6%); in no case was vagotomy performed. All patients had benign gastric ulcer, confirmed histologically, with a mean crater diameter of 1.7 cm as measured in the fixed operative specimen. Giant ulcers (>2 cm diameter)¹⁴ occurred in 15 men and 10 women; the mean age (60 years) and length of history (7.2 years) of this subgroup did not differ from those of the complete series.

Clinical Outcome

The mean length of follow-up was 9.4 years (range 3–15 years). Overall clinical (Visick) grading showed that 84% had an excellent or good result (grades 1 or 2), whereas 13 belonged to grades 3 or 4 (Fig. 1).

As this was a single assessment, patients were also graded on their symptoms at any time since operation. An attempt was made to grade the results in those who had died as well; the result was deemed good if there had been no dyspeptic symptoms since surgery and the patient had died from an unrelated cause (Table 1). This assessment showed that of the whole series, 77% of the patients had no history or record of any symptoms or events that would result in their being classified in

TABLE 1. Overall Clinical Results

	Good	Poor
At time of review	66	13
At any time	60	19
Those who died	39	10
Overall	77%	23%

TABLE 2. Symptomatic Grading 79 Patients at Follow-up

Symptoms	Number of patients with Visick Grades 3 and 4
Epigastric fullness	12
Bowel dysfunction	8
Flatulence	7
Bile vomiting	3
Early dumping	3

Visick grades 3 or 4. They were, therefore, adjudged to have had a symptomatically good result following gastrectomy.

The most common symptoms at the time of review were epigastric fullness after meals, mild bowel dysfunction, flatulent dyspepsia, and, to a lesser extent, bile vomiting and early dumping (Table 2). Six patients complained of ulcer-type pain, but altogether 16 patients had been reinvestigated at some stage for dyspepsia, and recurrent ulceration was found in five cases (3.5%). Three recurrent ulcers healed with medical treatment (excluding cimetidine), but two patients required truncal vagotomy. Another two had isoperistaltic jejunal interposition for bile vomiting, giving an overall reoperation rate of 2.8%.

Of the 49 deaths, one occurred 20 days after operation as a result of an anastomotic leak. One patient

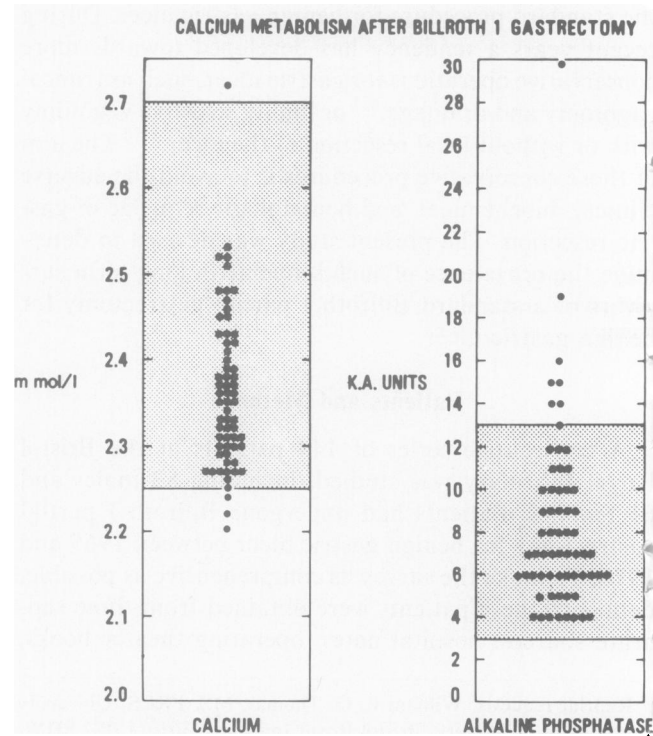


FIG. 2. Calcium metabolism after Billroth I gastrectomy. Stippled areas show normal range of values.

died of carcinoma of the gastric remnant two years after surgery and another from a reticulum cell sarcoma of the stomach at three years. In both these patients, histologic review of their initial lesion confirmed the benign nature of the gastric ulcer, with no evidence of malignancy. One death occurred from reactivation of pulmonary tuberculosis 13 years after gastrectomy. In 36 cases, the cause of death was unrelated, and in the remaining nine it was unknown.

Investigations

There was no clinical, biochemical, or radiologic evidence of metabolic bone disease or malabsorption. Only three patients had mild hypocalcemia (Fig. 2). The one patient with marked elevation of serum alkaline phosphatase had severe rheumatoid arthritis. Most patients had gained weight; for those patients in whom paired data were available, the mean preoperative weight of 59.7 kg (SD \pm 11.71) had increased to 64.1 kg (SD \pm 12.7) at follow-up ($p < 0.001$) (Fig. 3). There was

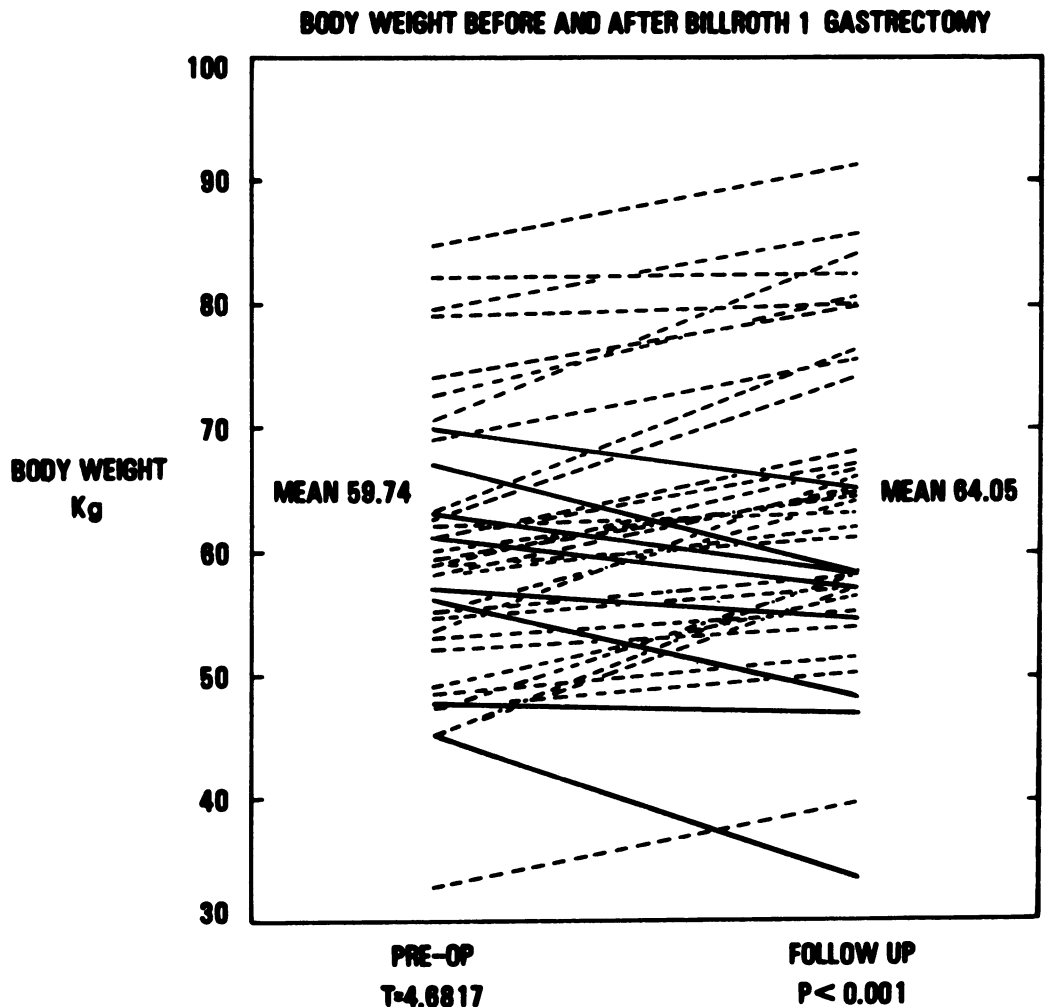
no instance of hypoproteinemia, the lowest value for serum albumin being 35 g/L.

An arbitrary hemoglobin concentration of 12 g/dL was taken as the lower limit of normal, and by this criterion, 16 patients were found to be anemic. However, most patients appeared able to correct a preoperative anemia (Fig. 4). Thirty-two patients were iron deficient ($<14.0 \mu\text{mol/L}$), but only 14 of these were actually anemic at the time of follow-up (Fig. 5). The other 18 may represent patients who would become anemic with the passage of time. Marginal reduction in serum levels was found for vitamin B₁₂ in two patients and folate in six (Fig. 6). Immunoglobulin profiles were mostly normal (Fig. 7). Assays of IgA, IgG, and IgM showed no consistent relation either to the patient's clinical grading or to any symptomatic or metabolic abnormality.

Discussion

These results confirm the lasting value of Billroth I partial gastrectomy in the treatment of benign gastric

FIG. 3. Body weight before and after Billroth I gastrectomy.



HAEMOGLOBIN BEFORE AND AFTER BILLROTH 1 GASTRECTOMY

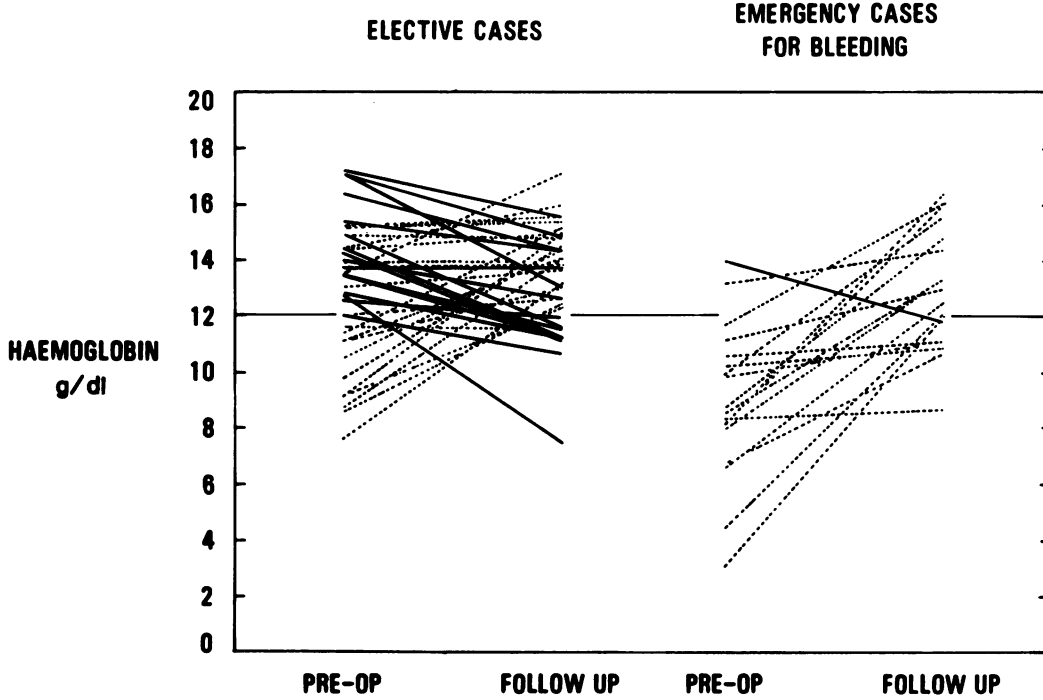


FIG. 4. Hemoglobin before and after Billroth I gastrectomy.

ulcer. Our findings support those of other workers, showing the success of this operation,¹⁵ especially since it became recognized that a 50–60% resection is usually adequate.¹⁶ However mortality rates of up to 5% have encouraged the search for safer procedures.^{15,16} Reviewing 1,252 Billroth I gastrectomies, Duthie¹⁷ reported an

average mortality of 1.8%, ranging from zero to 2.9%. In the present series the operative mortality rate was 0.7%, which compares favorably with the low mortality of vagotomy and drainage (about 1%).¹⁸ Although Billroth I gastrectomy therefore appears a safe procedure, the same may not apply to high gastric resection for

IRON DEFICIENCY ANAEMIA AFTER BILLROTH 1 GASTRECTOMY

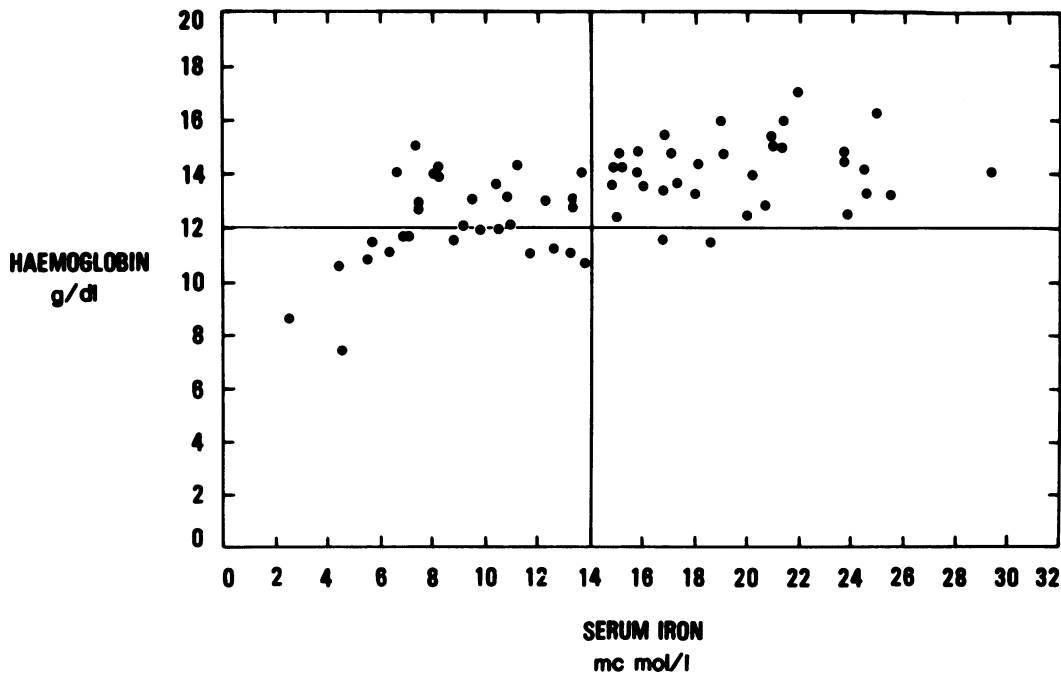


FIG. 5. Iron deficiency anaemia after Billroth I gastrectomy.

an ulcer situated near the cardia, which may increase this otherwise low death rate.¹⁹

Published recurrence rates following Billroth I gastrectomy average 1.5% (zero to 4.4%).¹⁷ In the present series, there was a recurrence rate of 3.5%, which is considerably lower than rates of 8–14% for truncal vagotomy^{7,12} and 15% for highly selective vagotomy.¹⁰ The increase of recurrent ulceration inevitably affects reoperation rates, which are significantly greater in patients undergoing vagotomy than those submitted to gastrectomy.²⁰ Our reoperation rate of 2.8% included only two patients with recurrent ulceration, the other two undergoing jejunal interposition for bile vomiting. Thus it appears that Billroth I partial gastrectomy in this series is more effective than the published rates for vagotomy in curing the ulcer, but this advantage may in part be related to excision of the ulcer²¹ and the diseased mucosa in which it has arisen. If the ulcer is left *in situ* during highly selective vagotomy, the recurrence rate rises,⁶ and multiple biopsies are essential to exclude malignancy.⁵ Partial gastrectomy usually obviates this necessity, as in most cases the ulcer is included in the resected specimen.

In view of the low rates for mortality and recurrent ulceration after Billroth I partial gastrectomy, any alternative procedure would need to show a substantial improvement in overall clinical results to merit universal adoption. Prospective randomized trials comparing par-

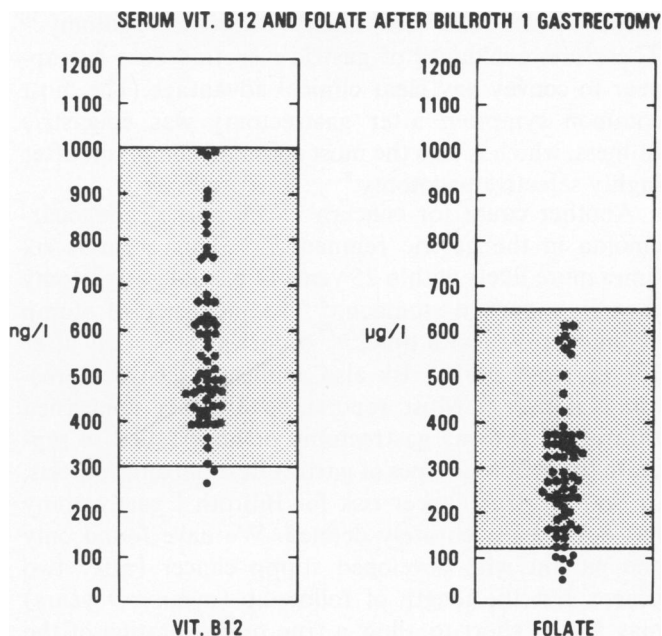


FIG. 6. Serum vitamin B₁₂ and folate after Billroth I gastrectomy. Stippled areas show normal range of values.

tial gastrectomy with vagotomy and drainage have shown no such difference between the two procedures.^{20,22} In the present series, 84% of patients had achieved good clinical results nine years after operation, compared with figures of 68–78% for truncal vagot-

IMMUNOGLOBULIN LEVELS AFTER BILLROTH I GASTRECTOMY

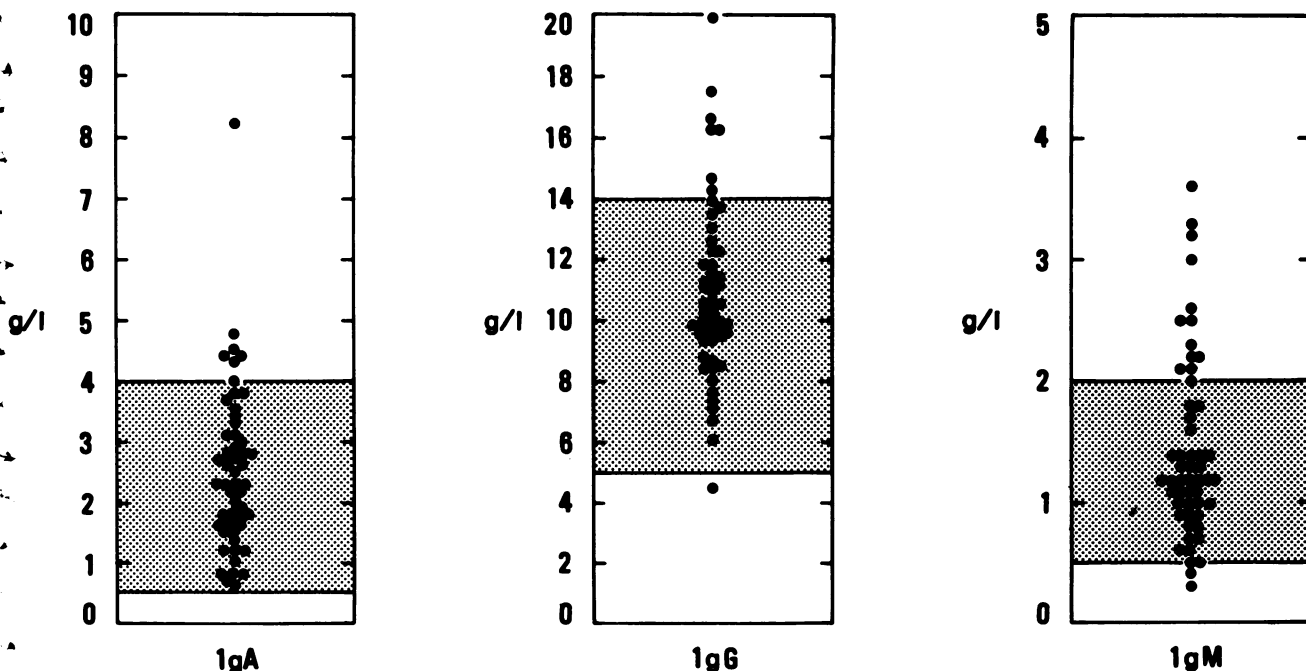


FIG. 7. Immunoglobulin levels after Billroth I gastrectomy. Stippled areas show normal range of values.

omy^{7,20,22} and 78% for highly selective vagotomy.¹⁰ Therefore, avoidance of gastric resection does not appear to convey any clear clinical advantage. The most common symptom after gastrectomy was epigastric fullness, which is also the most common complaint after highly selective vagotomy.⁸

Another cause for concern is the risk of adenocarcinoma in the gastric remnant.²³⁻²⁶ This event is six times more likely within 25 years of partial gastrectomy than in a normal stomach.²³ The incidence of stump carcinoma rises with time,^{23,27} occurring especially after 15 years. A similar risk also applies to gastroenterostomy alone.^{23,25} Most reports have either concerned Billroth II (Polya) gastrectomy or have failed to separate the different types of gastrointestinal anastomosis, so that the true cancer risk for Billroth I gastrectomy has not been accurately defined. We have found only one patient who developed stump cancer (after two years), but the length of follow-up (mean = 9 years) may be too short to allow a true representation of the cancer risk after Billroth I gastrectomy. However, certain workers feel that the gastrojejunostomy is the important factor predisposing to cancer^{28,29} by producing a chronic gastritis, which is much less common after pyloroplasty or Billroth I anastomosis.²⁹

Adverse metabolic consequences of this procedure appear to be minimal.³⁰ Other workers have described an incidence of 30-62% for defects in calcium metabolism or steatorrhea following Billroth II (Polya) gastrectomy,^{31,32} falling to 15% for Billroth I gastrectomy.³¹ In this present series, three patients only had minimal hypocalcemia, and none showed radiologic evidence of osteomalacia. Interestingly, most patients were able to maintain or even increase their weight over preoperative values. This finding, together with normal serum albumin levels, suggests that very little malabsorption resulted from this procedure, although no fecal fat measurements were taken to substantiate this claim.

The clear tendency towards iron deficiency anemia is a well-recognized sequel of partial gastrectomy.³³⁻³⁵ In one review of 292 patients surviving for up to 20 years after Billroth I or II gastrectomy, 52% of patients were anemic, and 63% had iron deficiency.³⁵ The risk of iron deficiency increases with time.³³ In our series only 16 patients became anemic, but 32 were found to be iron deficient. Again, a follow-up period of 9-10 years is probably insufficient time for the true incidence of anemia to become apparent; but in the context of gastric ulceration, 9-10 years is a long period, since one-third of our patients had died during this time. Megaloblastic anemia was not encountered, although three patients were already on vitamin B₁₂ supplements, and another eight had marginal reduction in serum B₁₂ or folate. Thus most patients were able to correct a

preoperative anemia, and in the other 16, normal hemoglobin levels were readily restored by oral iron therapy.

These very satisfactory results have been achieved by a variety of surgeons in a single general hospital. They therefore represent the results of routine surgical practice and give strength to our conclusion that Billroth I partial gastrectomy should remain the treatment of choice for most patients with benign gastric ulcer. The operation has stood the test of time, and lesser resections have reduced the death rate and side effects to a minimum. The procedure is safe and nearly always cures the ulcer diathesis. However, vagotomy and excision of the ulcer may reasonably be preferred for ulcers close to the cardia or in patients who are frail and elderly. The choice of truncal vagotomy or highly selective vagotomy remains with the individual surgeon. Although encouraging results have been reported from many centers, no convincing advantage over Billroth I partial gastrectomy has yet been shown for either "conservative" procedure.

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