Partial gastrectomy for haemorrhage

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SUMMARY An analysis was made of the results of 566 partial gastrectomies for haemorrhage from gastroduodenal ulceration between 1953 and 1962 with regard to mortality, morbidity, and long-term follow up.

With rigid criteria for selection of patients for surgery, the overall mortality rate for ulcerative gastroduodenal haemorrhage was 8.6%. The actual operative mortality rate more than doubles if an emergency operation is performed later than four days after the patient's admission with haemorrhage.

Postoperative and later bleeding complications occurred in 5% of patients.

Regardless of the length of ulcerative history, over 92% of patients have clinically satisfactory long-term results. Six per cent required further operation, after which, they too had clinically satisfactory results.

Gastroduodenal haemorrhage due to peptic ulceration still carries with it a significant mortality and morbidity, despite our increased knowledge of the pathology of the circulatory changes which take place, and, as a consequence, recent improvements in resuscitation techniques.

There have been many papers written on the short-term results of a particular regime of management in this condition, but very few indeed on the long-term follow up of these patients. While it is realized that the prime motive in the treatment of this catastrophe is to save life in the early phase, before discussing the complete merits of any particular regime it seems proper to analyse the long-term effects of that regime as part of the overall management.

In the Gastric Unit at St James' Hospital, Balham, where gastrointestinal haemorrhage has been a particular interest since 1940, 3179 patients were admitted with bleeding due to peptic ulceration or gastritis up to the end of 1967. The definitive diagnoses can be seen in Table I.

The particular routine for managing these cases which was evolved after clinical trials before 1950 (published by Desmond, in 1962) has remained essentially unchanged since.

The first step has always been to obtain adequate resuscitation of the patient, and then proceed to the various diagnostic investigations.

Barium studies, in the early years, were usually performed when the patient had ceased bleeding and thus possibly not for some four to five days after

Diagnosis	No. of Cases
Duodenal ulcer	1 308
Gastric ulcer	1 337
Gastritis	271
Hiatus hernia and/or oesophageal ulcer	112
Recurrent ulcer	151
Total	3 179
Other known causes of bleeding	271
Undiagnosed bleeding	129
Grand total	3 579

Table I *Causes of gastroduodenal haemorrhage 1940-1967*

admission. This plan has slowly altered over the years and now these studies are usually performed in the first 24 hours, and certainly within the first 48 hours. Definitive diagnoses have thus been made earlier.

Gastroscopy, as an aid to diagnosis, has been utilized throughout the life of the unit, and nearly all patients have been gastroscopied (recently, with the fiberoptic gastroscope) within the first 48 hours of a haemorrhage. It has been found that the best time for this investigation is within the first 48 hours, before small lesions, such as gastritis, acute erosions, or Mallory-Weiss tears, have healed (Tanner, 1964). Early gastroscopy in this series has probably been the main reason why the undiagnosed number is so small, relative to many other similar quoted series.

Since 1950 the selection of patients for surgery has been the result of careful study, and this policy has been strictly adhered to since (Table II). In Table II 'severe haemorrhage' refers to a patient who has

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Age (yr)	History of Ulcer	Severity of Bleed	When to Operate
Over 50	Good	Severe	Immediately
		Mild	At first repeat of bleed
	Poor	Severe	At first repeat of bleed
		Mild	If medical treatment fails
Under 50	Good	Severe	At first repeat of bleed
		Mild	If medical treatment fails
	Poor	Severe	If medical treatment fails
		Mild	If medical treatment fails

Table II Circumstances indicating when to operate in cases of gastroduodenal bleeding (Desmond, 1962)

become 'shocked' from the haemorrhage, where the systolic blood pressure falls below 100 mg Hg or if the haemoglobin falls below g7%. Mild haemorrhage has been regarded as anything short of this. Absolute indications for surgery in any case are bleeding associated with perforation or stenosis, persisting severe ulcer pain, and continuous bleeding.

Once surgical treatment has been decided upon, partial gastrectomy has been the procedure of election throughout.

Material and Methods

A group of 566 consecutive partial gastrectomies for haemorrhage in patients with gastroduodenal ulceration performed between 1953 and 1962 was chosen, and these patients have been followed for periods ranging from five to 15 years. It is a retrospective review in which the method of follow up has been from complete case records, personal interview, and questionnaire. Questionnaires were sent to all patients under the age of 80 at the time of operation who had not been seen personally during the years 1967 and 1968.

These 566 partial gastrectomies were performed from a total of 1 427 patients admitted with bleeding during that particular period. Three hundred and sixty-seven were performed as emergencies to control haemorrhage, and 199 for failed medical treatment. The latter patients were assessed as deserving of surgery on previous medical grounds, taking into consideration a history of ulcer, previous bleeding, or perforation. They were treated for this particular episode of bleeding conservatively and subsequently had an elective operation.

During this time there were also 40 other operations performed for bleeding, which ranged from stab drainage of the peritoneal cavity for associated perforation in a moribund gentleman, to vagotomy and underrunning procedures.

Results

AGE/SEX INCIDENCE

Of the 566 patients, 248 males and 119 females came to emergency surgery, a ratio of 2:1, and 157 males and 42 females had elective partial gastrectomy, a ratio of 4:1.

One hundred and fifty (23%) of those admitted with duodenal ulcer had emergency surgery compared with 166 (30%) of gastric ulcer patients. The age distribution of those requiring emergency operation compared with the total admitted can be seen in Figures 1 and 2. With duodenal ulcers, the mean age of those admitted was 55 years and those operated on was 61 years. With gastric ulcers the mean age of both those admitted and operated upon was 62 years, the sex incidence being roughly equal, but the mean age of the females was slightly higher than of the males.

Twenty-eight per cent of females and 22% of males with duodenal ulcer required emergency surgery compared with 25% of females and 36% of males with gastric ulcer.

OVERALL MORTALITY

The overall mortality of all cases admitted during the 10-year period can be seen in Table III. The overall mortality was 8.6% and it can be seen how the mortality increases markedly with age up to 23% for patients over 80 years of age.

Age (yr)	No. of Patients	Mortality (%)
Under 50	424 (30%)	0.5
Over 50	1 003 (70%)	12.0
Over 60	714 (50%)	15.0
Over 70	421 (30%)	19.0
Over 80	109 (8%)	23.0
Total	1 427 (100%)	8.6

Table III Overall mortality for haemorrhage from gastroduodenal ulceration 1953-1962

Fig. 1 Age distribution of patients with duodenal ulcer admitted with haemorrhage compared with those requiring operation.

Fig. 2 Age distribution of patients with gastric ulcer admitted with haemorrhage compared with those requiring operation.

The overall mortality for patients with the individual ulcer is different, being 12% for gastric ulcer and 7% for duodenal ulcer, a rough ratio of 2:1, which has been constantly found throughout the 30 years' function of the unit, and is in accord with most other series reported.

OPERATIVE MORTALITY

The operative mortality rates for emergency operation between 1953 and 1962 can be seen in Table IV. If a patient is bleeding severely enough to warrant emergency operation according to the criteria mentioned above, the mortality was roughly double the overall mortality for all age groups.

Age (yr)	No. of Patients	Mortality (%)
Under 50	72 (20%)	1.0
Over 50	295 (80%)	22.0
Over 60	213 (57%)	26.0
Over 70	112 (30%)	30.0
Over 80	18 (5%)	44.0
Total	367 (100%)	17.0

Table IV Mortality of emergency gastrectomy for haemorrhage from gastroduodenal ulceration 1953-1962

LONG-TERM FOLLOW UP

The overall results for those patients who underwent surgery, analysed according to the Visick classification (1948), are seen in Table V. About 92 to 93% of both groups have been classified as satisfactory, with very good results in about 91% of each group. This compares favourably with those long-term

Visick Category	Emergency Partial Gastrectomy	Visick Category	Later Partial Gastrectomy
I	147	I	113
II	29	II	11
III _s	6	III _s	3
III _u	2	III _u	1
IV	12 (5%) ¹	IV	9 (3.5%) ¹
Total	196		137
Operative death	64 (17%)	Operative death	7 (3.5%)
Late death <5 years	32	Late death <5 years	10
Lost to follow up	75	Lost to follow up	45
Grand total	367		199
Average bed stay	21 days	Average bed stay	14 days

Table V Overall results of 566 partial gastrectomies for haemorrhage due to gastroduodenal ulceration followed up for five to 15 years

¹Figure in brackets represents actual recurrent ulcer rate.

results on all elective cases reported by Tanner in 1959.

Of those classified Visick III_u, one woman of 77 years had indigestion and some bile regurgitation intermittently, while taking cortisone for rheumatoid arthritis. One woman of 70 years had spasmodic attacks of diarrhoea but is well in between, and one man had intermittent bouts of abdominal pain with repeatedly negative investigations.

The diagnosis and subsequent fate of those classified as Visick grade IV can be seen in Table VI. Apart from one re-operative death for a perforated stomal ulcer, all have been lifted into a satisfactory classification after further operation, so

Initial Findings				Subsequent Fate			Present Visick Class
Sex	Diagnosis	Operation	Date	Diagnosis	Operation	Date	
<i>Emergency Gastrectomy</i>							
M	DU	Polya	1953	Stomal	Oversewn perforation	1954	I
					Higher gastrectomy for bleeding	1954	
					Vagotomy	1955	II
M	DU	Polya	1953	Stomal	Oversewn perforation	1956	
					Vagotomy	1957	I
M	DU	Polya	1961	Stomal	Vagotomy	1965	
M	DU	Polya	1961	Stomal	Oversewn perforation	1961	I
					Oversewn perforation	1962	
					Higher gastrectomy	1962	II
M	DU	Polya	1957	Stomal	Vagotomy, revision	1960	
					gastrectomy		II
M	DU	Polya	1953	Stomal	Higher gastrectomy	1965	II
M	DU	Polya	1956	Stomal	Vagotomy, higher	1959	IIIs
					gastrectomy		Diarrhoea
M	DU	Polya	1953	Stomal	Revision gastrectomy for perforation	1961	Operative death
M	GU	Billroth I (blind)	1953	Recurrent GU	Polya	1965	I
M	GU	Billroth I	1958	Bilious vomiting	Roux conversion	1965	IIIs Bouts of vomiting
M	GU	Billroth I (blind)	1957	Recurrent DU	Polya	1966	I
F	GU	Billroth I	1961	Erosive gastritis	Polya	1966	I
<i>Later Gastrectomy</i>							
F	Gastritis	Billroth I	1953	Recurrent bleeds	Higher gastrectomy	1958	Late death unrelated
F	GU	Billroth I	1954	Stomal	Polya	1965	II
F	DU	Billroth I	1955	Bleed	Polya, no ulcer found	1965	IIIs
					Oversewn perforation, vagotomy	1964	I
M	DU	Polya	1961	Stomal	Vagotomy re-fashioned, higher	1959	I
					gastrectomy		
M	DU	Polya	1960	Stomal	Vagotomy	1967	I
M	DU	Polya	1958	Stomal	Vagotomy	1960	IIIs Diarrhoea
M	DU	Polya	1959	Stomal	Vagotomy	1963	I
M	DU	Polya	1962	Stomal	Vagotomy, higher	1967	I
					gastrectomy		

Table VI Subsequent fate of Visick IV patients after emergency and later gastrectomy

that after these operations 99% of the total had satisfactory results.

Forty-two patients were found to have died before five years of follow up—none apparently due to further ulcer problems but all of other diseases.

The average stay in hospital was three weeks for those having emergency partial gastrectomy and two weeks for those having a subsequent elective operation.

LONG-TERM MORBIDITY

The main residual disabilities some patients suffer after operation are seen in Table VII.

Fullness after eating a big meal is a fairly common phenomenon, but most patients find they can eat a smaller meal with no ill effects. Some form of 'dumping' occurs in about one-third of patients, but again usually only after a fairly heavy meal. As has

Residual Disability	Percentage of Total
Fullness after eating a very big meal	61
Occasional fullness after average meals	12
Palpitations after eating	9
Occasional tiredness after eating	28
Attacks of diarrhoea	23
Regained preoperative weight	59
Reduced weight, but steady	40
Steadily losing weight	1

Table VII Residual disabilities after partial gastrectomy for bleeding

been seen (Table V) it is only very few patients who cannot control these mild symptoms with simple dietary care.

Attacks of diarrhoea occur in 23% of patients but fortunately in most patients these attacks are very infrequent, perhaps once or twice a year, and rarely

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causing the bowels to open more than two or three times a day. Between attacks they have normal bowel habits.

Almost 60% of patients after partial gastrectomy for haemorrhage regain their preoperative weight. Only 1% seemed to be steadily losing weight at the time of review, and these three patients had other disease states as well.

TIMING OF OPERATION

Figure 3 analyses the connexion between the day of operation and the corresponding mortality. It can be seen that the operative mortality rate rises from 14% on day 0 to more than double, 33%, if operation is not until the fourth day after admission, and more than trebled, 52%, if operation is not until one week after admission.

All of these patients had emergency operations, but, as can be seen, many were not operated on until several days had elapsed. Either the bleeding was not thought to be as severe on admission as subsequently it proved to be, or bleeding continued unabated, or a further severe episode of bleeding occurred while the patient was in hospital recovering from the first.

SHORT V LONG HISTORY

One of the main purposes of this review was to verify or refute the statement often made that 'patients who have a partial gastrectomy when there is no significant history do badly'. Table VIII compares the results of those patients who had emergency operation when the history of dyspepsia

Fig. 3 Mortality rate compared with days from admission to emergency operation

Visick Category	History < Three Months	Visick Category	History Three Months
I	26	I	119
II	1	II	24
III _s	1	III _s	5
III _u	1	III _u	2
IV	1	IV	11
	28		161
Operative death	17	Operative death	41
Late death	7	Late death	23
<5 years		<5 years	
Lost to follow-up	13	Lost to follow-up	51
	65		276

Table VIII Emergency gastrectomies for gastric and duodenal ulceration

was less than three months with those with a history of more than three months. The numbers are naturally small in the 'less than three months' group but there would seem no reason for delaying operation in patients with a history of less than three months on the grounds that they do badly in the long term. The long-term results are similar in both groups. The operative mortality in the 'less than three months' group, however, is 26% compared with 15% in the group with a long history.

MORTALITY AND MORBIDITY

An analysis of the cause of postoperative mortality (Table IX) shows a multiplicity of aetiological factors. Bronchopneumonia was common as many of these patients in London already had severe bronchitis before operation, and anaesthesia, together with the major operation, in this group understandably causes a significant mortality.

About half of the deaths are due to disease unrelated to the gastrointestinal haemorrhage.

Cause of Postoperative Death	No.
Haemorrhage from suture line	4
Haemorrhage from inadequate underrunning	1
Unknown upper gastrointestinal haemorrhage	2
Duodenal stump leakage	1
Leaking anastomosis	4
Cardiac arrest on table	3
Within 24 hours—poor preoperative state	9
Myocardial infarction	7
Congestive cardiac failure	6
Bronchopneumonia	12
Pulmonary embolus	4
Enterocolitis	2
Pancreatitis	2
Cerebrovascular accident	3
Uraemia, chronic nephritis	3
Subphrenic abscess	3
Associated terminal malignancy	3
Dissecting aneurysm	1
Bleeding from adenoma D-J flexure	1
	71

Table IX Causes of postoperative death

Wound complications (Table X) were the commonest cause of postoperative morbidity, but also noteworthy is the number of patients dying from carcinoma of the lung and the number of patients later developing gallbladder disease or tuberculosis.

Four patients later developed malignancy in the stomach remnant.

<i>Cause of Postoperative Morbidity</i>	<i>No. of Cases</i>
<i>Early</i>	
Wound complications—	
Stitch abscess	10
Wound dehiscence	3
Gastric fistula	1
Duodenal fistula	1
Pancreatic fistula	1
Continued bleeding from retained stomal ulcer	1
Subphrenic abscess	1
Lung abscess	1
Pyæmia	1
<i>Late</i>	
Incisional hernia	8
Intestinal obstruction—	
Adhesions	4
Bolus	2
Stammer loop	1
Homologous serum jaundice	1
<i>Later Complications</i>	
Carcinoma in stomach remnant	3
Leiomyosarcoma in stomach remnant	1
Carcinoma of lung	10
Gall bladder disease	5
Tuberculosis	4

Table X *Causes of postoperative morbidity*

RECURRENT BLEEDING

In this series there were seven postoperative deaths due to continued or recurrent gastrointestinal bleeding. Three patients were found at necropsy to have bled from the anastomosis, one from erosive gastritis, and one from an inadequate under-run of a duodenal ulcer when the duodenum was closed proximally. The usual practice of the unit is in fact to remove the ulcer, or peel it off the pancreas, and close the stump distal to the ulcer. In two patients no definite bleeding site could be found.

Only one patient had a second operation for bleeding in the postoperative phase, and this came from a stomal ulcer left in the jejunum. This patient survived.

During subsequent years, six patients with stomal ulcers presented with recurrent bleeding. Three patients with erosive gastritis underwent further surgery for recurrent bleeding, and six patients were admitted with recurrent bleeding which was investigated, erosive gastritis diagnosed and conservative therapy proved satisfactory. Four other patients bled again and a definite diagnosis was not made. All of them were treated conservatively and have had no further trouble. One woman died as a

result of a recurrence of bleeding but the diagnosis was not established as necropsy was not permitted.

This gives an overall long-term recurrence of bleeding rate of 5%, but only 2.2% in the post-operative period and first postoperative year, and it is this latter period which is usually quoted when comparing series.

ASSOCIATED PERFORATION

Twenty patients had a partial gastrectomy for a perforation associated with the initial haemorrhage. Four patients had perforated gastric ulcers and 16 patients had associated perforated duodenal ulcers. Of the gastric ulcer patients, three survived. Of the duodenal ulcer patients, 11 survived. That is, of those patients having a partial gastrectomy for bleeding and associated perforation from an ulcer, only 14 (70%) survived the hospital admission. Twelve (86%) of those, however, fell into the Visick I category at five years.

During the same 10-year period, five other procedures were performed for associated perforation, with only one survival. This patient had a perforated duodenal ulcer oversewn and a gastrojejunostomy performed, and was classified Visick I at five years.

LATE LABORATORY TESTS

Late haemoglobin values were estimated on about half those patients who survived longer than five years. Figure 4 shows the distribution, the peak being between 13.0 to 14.5% g. However, 40 patients (26%) had a haemoglobin value of less than 11.6% g.

Fig. 4 *Haemoglobin estimation at long-term follow up*

There was no correlation between the haemoglobin value and the Visick classification, but when the serum iron values were determined on those patients who had not taken iron, although the numbers were small (Table XI), there did seem to be a better correlation. This has been borne out in clinical practice when it has been found in more recent years that if the serum iron level is low, despite a normal haemoglobin value, giving iron will frequently rid the patient of some postgastrectomy symptoms but more controlled studies must be made.

The serum vitamin B₁₂ level had been low in three patients in the series, all of whom had a macrocytic anaemia, and all were taking regular vitamin B₁₂ as a result.

Serum Iron Value ($\mu\text{g}\%$)	No. of Patients	Visick I
<90	90	13 (65%)
>90	18	15 (85%)

Table XI Serum iron estimations

Calcium levels and alkaline phosphatase levels were measured in 39 patients (Table XII). In only one case (case 26) was the calcium level raised above 10.8 mg% (the upper limit of normal for that laboratory), and this patient has consistently failed to attend for further investigation.

The alkaline phosphatase level was above 13 KA units in five patients (cases 13, 22, 27, 30, and 38—four females and one male), but in none of these patients was there clinical evidence of bone disease. If it is true that partial gastrectomy predisposes to later bone disease, perhaps it is these patients who will develop it. None of these biochemically abnormal patients has so far been followed up for longer than eight years, and hence sufficient time may not have yet elapsed for clinical bone disease to manifest itself.

TYPE OF OPERATION

Tables XIII and XIV show the long-term follow up relating the type of operation to the pathological type of ulcer. The Billroth I type of operation was

Case	Sex	Years after Operation	Visick Category	Ca	P	AP	Comments
1	M	7	I	10.1	3.6	9.8	
2	M	5	I			12.6	
3	M	5	I	10.7	2.6	6.2	
4	F	10	I	10.0	2.2	7.1	
5	F	5	I	9.9	2.9		
6	M	7	I	10.7	2.3	12.2	
7	F	6	II	10.7	3.7	4.8	
8	F	15	I	10.6	3.2	10.9	
9	F	7	I	10.6	2.9	8.5	
10	M	5	I	9.6	3.2	7.9	
11	M	5	I	9.8	2.8	10.8	
12	F	5	I	9.2			
13	F	8	III _s	10.7		27.3	Weight steadily down, later death, uraemia, chronic pyelonephritis
14	M	7	I		3.7	7.0	
15	F	5	III _s	9.6			
16	M	5	I	9.4	3.5	6.7	
17	M	9	I	9.1	3.3	9.3	
18	F	12	I	10.0	3.9	8.4	
19	F	6	II	10.7	2.1	5.4	
20	F	14	II	9.0	3.9	8.5	
21	F	10	I	10.0	6.7		
22	F	5	II	10.5	2.8	21.0	
23	M	8	I	9.8		12.4	
24	M	5	I			8.2	
25	F	12	II			11.6	
26	M	5	I	12.0	3.5	10.9	
27	F	8	I	8.9	3.1	17.2	
28	M	7	I	10.8	3.5	3.1	Late death (coronary)
29	M	12	I	9.8	2.6	7.9	
30	F	8	II	10.3		13.7	
31	M	11	I	10.0	3.1	12.2	
32	F	11	I	9.6	2.6	11.6	
33	M	5	I	10.4	3.5	5.8	
34	F	10	I	10.1	3.6	7.3	
35	M	11	I	9.5	3.5	11.5	
36	M	7	I			6.1	
37	F	8	II	9.7	2.5	7.0	
38	M	5	I			15.8	
39	F	5	I	10.0	3.4	7.9	

Table XII Calcium, phosphate, and alkaline phosphatase estimations

	DU	GU	GU & Gastritis DU		GJU	Comment
Visick I	9	88	6	2		
Visick II		17		2		
Visick IIIa	1	1		1		Billroth I for gastric ulcer
Visick IIIu		1				
Visick IV	1	5		1		Satisfactory 95%
Operative death	1	28	2	3		
Late death	1	17	2	1	1	Recurrent ulcer rate 3.6%
Lost to follow up	3	37	4	4		
Total	16	194	14	14	1	

Table XIII Follow up after Billroth I type of gastrectomy for five to 15 years

	DU	GU	GU & Gastritis DU		GJU	Comment
Visick I	123	18	10	1	3	
Visick II	17	1	2	1		Polya for prepyloric, pyloric, and duodenal ulcer
Visick IIIa	4	1	1			
Visick IIIu		2				
Visick IV	14					
Operative death	33			2	2	Satisfactory 92%
Late death	10	6	3			Recurrent ulcer rate 7.3%
Lost to follow up	55	4	3	3	5	
Total	256	32	19	7	10	

Table XIV Follow up after Polya gastrectomy for five to 15 years

usually chosen for gastric ulcer, and the Polya operation for duodenal ulcer, but there was some overlap. Thirty-two patients with gastric ulcer had a Polya operation, 13 of these being for prepyloric or pyloric ulceration. Sixteen patients with duodenal ulcers were treated by Billroth I operation with remarkably good results, considering that it is generally believed there is between a 15 and 30% recurrence rate for this operation.

The Billroth I type of gastrectomy for gastric ulcer with haemorrhage gives 95% satisfactory results with a recurrent ulcer rate of 3.6%.

The Polya operation for duodenal, prepyloric, and pyloric ulceration, with haemorrhage, gives 92% satisfactory results, with a recurrent ulcer rate of 7.3%.

Discussion

The surgical management of haemorrhage due to peptic ulceration is still under review. There are many who advocate gastric resection for this disease, but more recently there has been a marked

swing in favour of vagotomy and underrunning procedures. Those authors who advocate the latter report that operative mortality rates are lower than with gastric resection, while those authors who favour partial gastrectomy point out that it is the bleeding which needs control and this is more certain with resection procedures.

It was against this background that this series of patients was investigated, not only with mortality and recurrent rates in mind, but also with the results of long-term follow up as they may influence decisions regarding future surgical planning.

The overall mortality rate in this series compares with other gastric resection series of 5.9% reported by Large in 1960 and 7.7% reported by MacCaig, Strange, and Norris (1964), particularly bearing in mind that this series contained a much higher percentage of gastric ulcer patients who have a relatively higher mortality rate. This also compares with 9% reported in the series by Schiller, Truelove, and Williams (1970), when surgeons were predominantly doing vagotomy and underrunning procedures.

Actual operative mortality rates will vary greatly according to the particular criteria of selection for surgery up to 36% (Foster, Hickok, and Dunphy, 1964; Neilsen and Amdrup, 1968). These figures of themselves mean little unless put into the context of the overall mortality rate for all patients admitted with haemorrhage. For, as Schiller *et al* (1970) pointed out, despite a policy change from gastrectomy to vagotomy, and a consequent reduction in operative mortality, the overall mortality remained the same, as they were operating on fewer patients and had a correspondingly higher mortality rate in the unoperated patients.

The operative mortality rate of 17% in this series is to be compared with the mortality of patients treated conservatively and not undergoing surgery of any kind—5.5%. This is a rather surprising figure but it includes those patients admitted moribund and unfit for surgery and those who die while inpatients with associated disease states. These groups also serve to keep the overall mortality to significant levels. Kelley, Grant, and Elliott (1963) quote a mortality rate of 8% for those patients they did not operate on.

In more recent years (1963-67), the overall mortality at St James' has been reduced to less than 7% with a corresponding fall in operative mortality, whilst in the last two years of that period, 1966 and 1967, the overall mortality dropped to 2.3% and operative mortality to 5%. Central venous pressure monitoring of resuscitation was introduced during the latter time and no doubt played a significant part in lowering mortality rates.

With regard to the timing of operation, mortality rises steeply with delay. If a patient bleeds again or continues steadily bleeding, particularly the elderly patient, his general condition becomes worse, and he correspondingly stands late emergency surgery the more poorly. Hence it would seem that a definite decision regarding surgery in a particular patient whose indications for surgery may be in doubt should be made as early as possible. Sir Gordon Gordon-Taylor used to talk about the 'golden 48 hours' in which to make this decision. This probably still applies today. Failure to maintain stability on 3 units of blood in 24 hours after the initial resuscitation seems one of the best criteria in deciding on the necessity for operation in the 'continued steady bleeding' group.

Figure 3 showing increased mortality with delay, together with Tables III and IV showing increased mortality with age, tend to suggest, and in fact confirm, what is now well recognized, that early operation in the elderly will give the best overall results.

The fact that there is no difference in long-term results between patients with long or short histories of dyspepsia does not, of course, mean that the criteria for operation should be relaxed, as this 'short-history' group is in any case only operated on for severity of bleeding and age. Rather, it means that if one is forced to operate on a patient without a significant history, according to the criteria mentioned, as good a long-term result can be expected as if there had been a long history of dyspepsia. There does, however, appear to be a significantly higher actual operative mortality rate if there is only a short history of dyspepsia.

With vagotomy and underrunning procedures, many reports suggest that the recurrent bleeding rates may be as high as 36% (Kelley *et al.*, 1963; Hamilton, Harbrecht, Robbins, and Noland, 1965) although Foster, Hickock, and Dunphy (1965) report a rate of only 7%. Recurrent bleeding rates after partial gastrectomy are usually quoted as around 5 to 8% (Foster *et al.*, 1965), although Serebro and Mendeloff (1966) quote a long-term follow-up recurrent bleeding rate of 31%.

The long-term recurrent bleeding rate in this series of 5% compares with 10% reported by Tanner (1964) for pyloroplasty and underrunning procedures which he did before the introduction of adjunctive vagotomy.

There have been relatively few long-term follow-up studies following surgery for ulcerative haemorrhage (Leape and Welch, 1964; Farris and Smith, 1967), but the recurrent ulcer rates appear to be significantly higher after operation for bleeding than when surgery is performed electively. Whereas in this

series the recurrent ulcer rates are 3.6 and 7.3% for gastric ulcer and duodenal ulcer respectively, in the same hospital the elective recurrent ulcer rates are about 2% for both types of ulceration. Leape and Welch (1964) also found that their recurrent ulcer rates following gastrectomy for haemorrhage were double that following elective gastrectomy, and they considered that the ulcerative diathesis was probably more severe in those patients who present with bleeding than in those who presented for elective surgery. Farris and Smith (1967) had a re-operation rate of 5% over five to ten years after emergency surgery for bleeding duodenal ulcer, which is twice that for similar cases in this series.

The long-term clinical and biochemical results after partial gastrectomy in this series compare favourably with those after elective gastric resection in the same hospital (Tanner, 1959).

Which operation should be performed for bleeding gastroduodenal ulceration? Goligher (1970), reporting on his controlled studies in Leeds, suggested that for elective operations there is little to choose between the overall results of gastric resection and vagotomy procedures, and our results would suggest that equally is this likely to apply for patients who present with bleeding. The benefits of better results will almost certainly come from better resuscitation techniques, both pre- and post-operatively, and earlier operation, particularly in the elderly age groups, rather than from which type of operation is chosen by any particular gastric surgeon.

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