THE DEFINITIVE TREATMENT OF BLEEDING PEPTIC ULCER*

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DURING THE LAST FOUR YEARS we have been testing the value of immediate blood replacement and gastric resection in patients with acute massive gastroduodenal bleeding diagnosed as being due to peptic ulcer. By the term "acute" we mean that the patient has shown gross evidence of bleeding within one week, and by the term "massive" bleeding, we mean bleeding of such severity as to lower the total circulating red cell mass to less than 60 per cent of normal. Patients who met these criteria but preferred nonsurgical treatment served as controls. Our experience now comprises 65 cases in the operative group with seven deaths (10.7 per cent) and 42 cases in the nonoperative group with nine deaths (21.4 per cent).

In previous reports, we have presented preliminary and tentative evaluation of our data.[1, 2] As the work has progressed, we have become convinced that massive bleeding from peptic ulcer is not uncommon, that it is life-endangering, and that it must be regarded as amenable to surgical arrest. Referring physicians evidently are coming to share our viewpoint, for fewer and fewer cases are available to us for control study without operation. The present report, therefore, deals with the last 50 consecutive cases treated by blood replacement and early operation, and consists of a clinical analysis of this experience. The mortality rate for the group was 6 per cent.

The method of handling these cases may be briefly described. On admission of a suspected case of acute gastroduodenal bleeding to the hospital, the resident and laboratory teams are immediately called. Blood studies are made within a half-hour, including the all-important measurement of total circulating red cell mass, as well as determinations to exclude hemorrhagic diathesis and primary blood diseases. As a part of the study also, plasma samples are taken for analysis of sodium, potassium, protein and non-protein nitrogen concentrations. After the initial blood samples are taken, transfusions are started in one or more veins, and the findings of the history and physical examination are checked. A nasogastric tube is placed and the gastric contents are examined for blood and acid. If a presumptive diagnosis of bleeding peptic ulcer is made and the criteria as to acuteness and severity of hemorrhage are met, laparotomy is begun without further delay, regardless of what the blood pressure reading may be and regardless of whether the patient may appear to be

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bleeding actively at the moment. At least three liters of properly matched blood must be on hand, however, and as anesthesia is begun, the rate of administration of blood is rapidly increased.

A few general remarks about this group of 50 patients are in order. For the most part, as shown in Table I, they were older patients with considerable associated disease. Nineteen patients, or 38 per cent, were in obvious hemorrhagic shock on arrival at the hospital. Forty-one patients, or 82 per cent, had recently vomited blood. Forty-two were males and eight females. With respect to history, the patients fell into two groups. Three-quarters of the patients had a long history of peptic ulcer symptomatology; three had had previous gastro-enterostomy, two had had suture of perforated ulcer, one had had gastric resection, and one had had gastro-enterostomy followed later by gastric resection. However, in about one-quarter of the group who proved to have hemorrhagic ulcer, the history was brief, nondescript and clinically inconclusive. As a rule, these were the patients with acute superficial ulcers. The

TABLE I.—*Data From 50 Consecutive Cases of Operation for Acute Massive Gastroduodenal Bleeding*

	Maximum	Minimum	Average
Age of patient.....	80 yrs.	22 yrs.	54 yrs.
Duration of symptoms....	40 yrs.	5 days	8 yrs.
Duration of bleeding.....	49 days	2.5 hrs.	4.7 days

average interval between admission and operation for the group as a whole was 12 hours, but in some instances operation was begun within two hours. The delay was usually occasioned by the procurement and processing of an adequate amount of blood for transfusion. It is true, however, that five patients had been treated for periods of seven to 17 days on a medical regimen in hospitals, and surgical aid was requested only after the internists became convinced the patients were failing.

Since the average age of the group was 54 years and some patients were quite elderly, various other unrelated diseases were often present. Four patients had hypertensive cardiovascular disease, and three others had arteriosclerotic heart disease with evidence of coronary insufficiency. Advanced cavitational pulmonary tuberculosis was present in two patients, three had pulmonary emphysema and two chronic bronchiectasis. Benign prostatic hypertrophy was present in two, urethral stricture in two, and in four there was evidence of chronic alcoholism.

For making a working diagnosis of bleeding peptic ulcer, we have relied chiefly on physical examination and history, blood studies and a process of exclusion. If portal hypertension and primary blood disease with bleeding tendency are excluded, the chances are better than nine to one in our experience that massive gastroduodenal bleeding is due to an ulcerating lesion of the stomach or duodenum. We have recntly been performing esophagoscopy

at the start of anesthesia in doubtful cases,[3] but we have not used radiologic methods of diagnosis to any great extent. In the exceptional case, roentgen ray study may be of value, but these patients vomit frequently and the stomach is often filled with clot. In a significant proportion of the cases also, the ulcers are shallow and presumably acute. These circumstances preclude finesse in radiologic diagnosis, although we do not mean to imply that such aid should never be sought in the acutely bleeding case. We have found that epigastric tenderness is usually present if searched for carefully and this sign is quite helpful in making the diagnosis.

As seen in Table II, we operated upon one patient with esophageal varices, and in two instances, a convincing explanation for the bleeding was not found at operation. On the other hand, subtotal gastric resection was performed for massively bleeding gastric carcinoma in one case, and for hemorrhagic lymphosarcoma in another. Recovery was uneventful in these five cases of bleeding

TABLE II.—*Diagnoses at Operation in 50 Consecutive Cases of Acute Massive Gastroduodenal Bleeding*

Duodenal ulcer, acute	6
Duodenal ulcer, chronic	19
Gastric ulcer, acute	5
Gastric ulcer, chronic	11
Gastric and duodenal ulcers, chronic	1
Gastrojejunal ulcer, acute	1
Gastrojejunal ulcer, chronic	2
Gastric carcinoma	1
Gastric lymphosarcoma	1
Esophageal varices	1
Uncertain	2
Total	50

from other causes, though further postoperative bleeding occurred in the patient with varices. In our opinion, unless a positive diagnosis can be made of bleeding varices or of abnormal bleeding tendency, exploratory laparotomy is in order. If active surgical therapy is withheld in cases of acute massive gastroduodenal hemorrhage, the physician assumes a grave responsibility and he should do so only for very good reasons.

When examination of the upper gastro-intestinal tract at laparotomy discloses no cause for the bleeding, the surgeon is faced with an exigent problem in surgical judgment. Our practice in this situation is to examine the stomach, duodenum, small intestine, esophageal hiatus, pancreas, liver, gallbladder, spleen and portal tributaries carefully, and if no other explanation for the bleeding is found, we proceed with subtotal gastric resection. Fatal bleeding may occur from single or multiple superficial ulcers of the stomach, or less commonly, of the duodenum, which cannot be felt, and visible serosal changes may be lacking. In about 20 per cent of the cases in this series, shallow bleeding ulcers which could not be detected at exploration were found in the removed specimen.

When we use the term "definitive treatment" in relation to this group of cases, we have a double meaning in mind. Not only is life-endangering bleeding arrested, but the peptic ulcer tendency is treated by an operation which offers the patient the best prophylaxis against recurrence of ulcer. In most instances, the same type of subtotal gastrectomy is performed which yields about a 90 per cent satisfactory five-year relief when performed for any of the other surgical complications of peptic ulcer. Follow-up studies on the present series of cases show an early promise of results equally as good as when the operation is done less urgently for obstruction, penetration or intractability of pain.

The standard gastric resection used in these cases consists of removal of 80 per cent of the stomach, as shown by actual measurements. The resection includes the ulcer when gastric in location, and it includes about two-thirds of the duodenal ulcers. All the pyloric mucosa is removed, the right and left gastro-epiploic arteries are ligated, as well as the right and left gastric arteries

TABLE III.—*Type of Operation Performed in 50 Consecutive Cases of Operation for Acute Massive Gastroduodenal Bleeding*

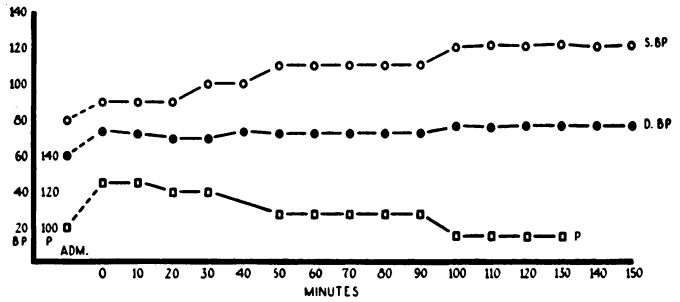
Operation	Number	Deaths
Standard (80%) gastric resection	40	2
Gastric resection with resection of gastrojejunostomy	1	0
Gastric resection with resection of jejunum and transverse colon	1	1
Gastric resection and excision of pyloric mucosa	4	0
Total gastrectomy	1	0
Total gastrectomy after gastric resection	1	0
Exploratory laparotomy, only	2	0
Total	50	3

and the recurrent and supraduodenal branches of the pancreaticoduodenal artery. In no instance, has the gastroduodenal artery itself been ligated in its supra-pyloric aspects. A Hofmeister, short loop antecolic anastomosis has invariably been used, and in almost every case, a left subcostal incision which crosses the midline has been employed. As shown in Table III, standard gastric resection was performed in 40 of the 50 cases. Prior surgical operation on the stomach necessitated modifications in several cases, and in one instance, the gastric ulcer was high on the lesser curvature and surrounded by so much inflammatory reaction that total gastrectomy was deemed advisable. Special interest attaches to the penetrating posterior wall duodenal ulcer with large pancreatic crater and much edema and induration of the surrounding tissues. In four such lesions, the operation described by Allen and Benedict was used to advantage, the pyloric mucosa being excised after isolation and devascularization of the pylorus and proximal duodenal margin.[4]

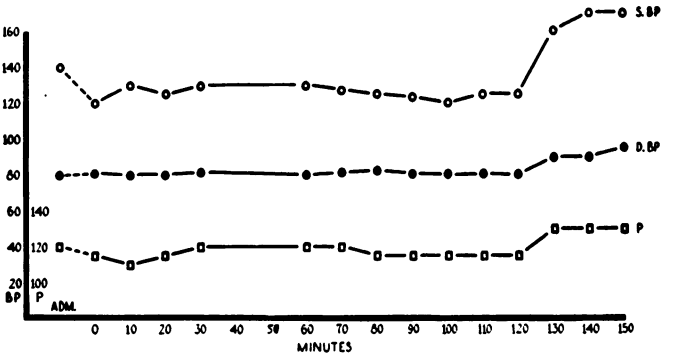
In this series, a frequent finding at operation has been distention of the stomach by a large collection of jelly-like clots. It is very helpful in this situation to free and immediately transect the pyloric antrum. The stomach is then

completely evacuated through its distal end without contamination of the field, care being used not to express blood into the esophagus. The operation is greatly facilitated by this maneuver. Ether-oxygen mixture given through an endotracheal tube has been used routinely for anesthesia. The anesthesia aspects of this problem are being analyzed in a separate communication.[5] However, it may be stated here that in these 50 cases the patient's condition

FIG. 1



R.R. - GASTRIC RESECTION FOR BLEEDING DUODENAL ULCER.
2500 cc BLOOD GIVEN DURING OPERATION



C.D - AGE 80 - GASTRIC RESECTION FOR BLEEDING GASTRIC
ULCER. 2500 cc BLOOD GIVEN DURING OPERATION

FIG. 2

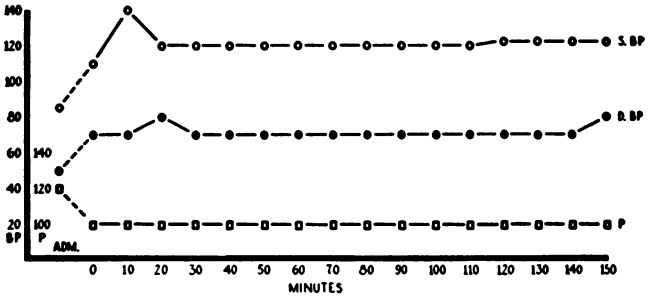
FIGS. 1 and 2.—Systolic blood pressure, diastolic blood pressure and pulse reaction during gastric resection for massively bleeding peptic ulcer. Ether anesthesia.

was almost always better at the end of operation than at the beginning. Figures 1, 2 and 3 illustrate this point.

The postoperative complications in this series of cases (exclusive of the three fatal cases summarized below) involved chiefly the cardio-respiratory system and the laparotomy wound. In six patients, there was poetoperative atelectasis, in one, bronchopneumonia, and in another, pulmonary infarction.

One patient developed cardiac decompensation and two, wound infection. In three patients there was wound separation of varying degree, and in three, there was some drainage of blood from the nasogastric tube for two or three

FIG. 3



F.W.- GASTRIC RESECTION FOR BLEEDING GASTRIC ULCER WITH ADVANCED PULM. TBC. 3400 cc BLOOD GIVEN DURING OPERATION

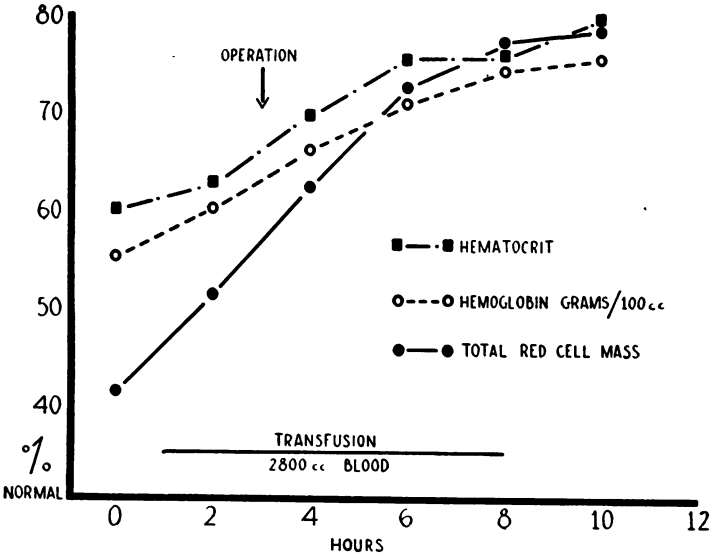


FIG. 4

FIG. 3.—Systolic blood pressure, diastolic blood pressure and pulse reaction during gastric resection for massively bleeding gastric ulcer. Ether anesthesia.

FIG. 4.—Postoperative values for circulating red cell mass, hematocrit and hemoglobin conc. in massive hemorrhage from peptic ulcer. Therapy by operation and blood replacement—values in 45 cases shown.

days after operation. There were two mild and one severe hemolytic transfusion reactions. Postoperative gastric retention was not noted, but in two patients there were mild symptoms of the so-called "dumping syndrome."

Postoperative anuria was not encountered in this series of cases. The three fatal cases are briefly abstracted.

M. B., a 75-year-old man, was admitted to the hospital with a 4-day history of melena, weakness, disorientation and convulsions. The gastric contents were bloody and the total circulating red cell mass was 18 per cent of normal. Gastric resection was performed 5 hours after admission, during which procedure 2500 cc. of blood were administered. Because of urinary retention and strictured urethra, suprapubic cystostomy was also performed. Evidence of intestinal obstruction and bronchopneumonia supervened and death occurred 11 days after operation. Autopsy was not performed.

A. L., a 60-year-old woman with a long history of peptic ulcer, was admitted to the hospital after 9 days of continued hematemesis and melena. The total circulating red cell mass was 23 per cent of normal. Subtotal gastrectomy was performed within 24 hours of admission, 4580 cc. of blood being given to her. The patient died on the fourth day after operation with signs of peritonitis, bronchopneumonia and cardiac decompensation. Autopsy was not performed.

F. B., a 51-year-old man, was brought to the hospital with a 4-hour history of massive hematemesis. Similar hemorrhages had occurred one, 12 and 28 years previously. Gastro-enterostomy had been performed 30 years before. The total circulating red cell mass on admission was 37 per cent of normal. The patient was operated upon within 12 hours, 3250 cc. of blood being given. Subtotal gastrectomy with resection of jejunum and transverse colon and cecostomy was carried out for penetrating marginal ulcer. The patient developed bronchopneumonia, wound infection and dehiscence, subphrenic abscess and gradually failed, death occurring 45 days after operation. Autopsy confirmed the clinical diagnoses and showed also multiple hepatic abscesses.

It is probably not necessary to point out that the successful surgical treatment of acute massive hemorrhage from peptic ulcer depends on the proper use of blood transfusion. Yet, in our opinion, surgeons and internists handling these cases have paid too little attention to hemoglobin-lack in the past. The simple facts that bleeding patients die of anoxia, that the longer anoxia goes uncorrected the greater the danger, and that in the anoxia of hemorrhage there is no substitute for hemoglobin, must form the conceptual basis for the management of the disease. If one considers two other facts, namely, that it is impossible to say with assurance whether bleeding has ceased and whether it will recur, and secondly, that bleeding from peptic ulcer can be surgically controlled, then the program of management which we advocate would seem to be a reasonable one.

Studies of the physio-pathology of hemorrhagic shock, stimulated by the problems of warfare, have produced new evidence on which to base restorative therapy in the condition. Acute losses of 50 per cent or even more of the total circulating red cell mass may not be immediately fatal in the previously healthy individual. In such patients, the only critical deviation from the normal prior to the onset of progressive organic deterioration is hemoglobin-lack. Large amounts of blood are urgently needed, much larger quantities than was formerly realized. In Table IV are shown pertinent data from the present series of cases. The average amount of blood given these patients in connec-

tion with operation was 3900 cc., and yet the red cell count rose from 2.6 mill/cmm. only to 3.7 mill/cmm., and the total circulating red cell mass increased from 43 per cent of normal only to 74 per cent. Since postoperative hemorrhage was not a problem in these patients, and since blood loss at operation averaged only 400 cc., it is clear that three liters of blood did not meet the replacement needs of these patients. Four or five liters would have been a more suitable quantity. Postoperative transfusion therapy was employed too little in this series of cases. Actually, 44 of the 50 patients received no blood at all postoperatively, chiefly because there was no further evidence of bleeding and convalescence proceeded satisfactorily.

It is important to realize that the data presented in Table IV are average data for the group. Evaluation of the hemorrhagic state of the individual patient is impossible without direct determination of total circulating red cell mass.[6] The reliability and practicability of the T-1824 dye technic for this purpose, as developed by Gregersen, has been amply substantiated.[7] A common

TABLE IV.—*Laboratory Data in 50 Consecutive Cases Operated Upon for Acute Massive Gastroduodenal Bleeding. Average Values Shown*

	Preoperative	At Discharge
Red cell count.....	2.6 mill./cmm.	3.7 mill./cmm.
Circ. red cell mass.....	43% normal	74% normal
Plasma protein.....	5.7 Gm./100 cc.	6.4 Gm./100 cc.

mistake in the current discussions of this subject is failure to report values for total circulating red cell mass. As a result, unwarranted and fallacious comparisons are made of various methods of treatment. During the earlier stages of severe hemorrhage, vasoconstrictive shunts and delay in hemodilution may suffice to maintain systolic blood pressure and red cell count within relatively normal ranges while total red cell mass is falling. Later, the characteristic rise in plasma volume and over-dilution of the blood may be associated with a rapid drop in red cell count and simulate further hemorrhage, whereas total circulating red cell mass may actually be increasing somewhat. The early disparity between concentration and circulating quantity of red cells is brought out in Figure 4, which is a composite presentation of data from 45 cases. The inadequacy of the amounts of blood given, which averaged 2800 cc., is also apparent.

In conclusion, our experience as analyzed in this report leads us to the conviction that early gastric resection offers the best results in the treatment of acute massive hemorrhage from peptic ulcer, provided proper surgical and transfusion facilities are at hand. The method is definitive in that anemia can be corrected, bleeding can be arrested, and the tendency to form new peptic ulcers can be controlled.

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