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MASSIVE UPPER GASTROINTESTINAL HEMORRHAGE

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The treatment of the bleeding patient is a continuing challenge to all clinicians. Although there is still considerable morbidity and mortality with major hemorrhage, major advances have been made in the care of such patients. For example, the ability to evaluate and compensate for circulatory deficits has been markedly improved by the routine use of pulmonary artery pressure monitoring devices; impending or frank respiratory failure can now be treated by volume respirators and the utilization of positive airway pressure apparatus; cardiac arrhythmias are managed with transvenous pacing wires; acute renal failure can be treated successfully by temporary hemodialysis. None of the modalities by itself has altered the fact that major hemorrhage has significant risk for mortality[31].

The most important aspect of the care of bleeding patients is selection of the optimal treatment for the underlying condition from which the bleeding episode has resulted. For example, a patient with recurrent bleeding from a duodenal ulcer requires a definitive operation to control the source of bleeding and reduce secretion of acid; on the other hand, a patient with massive trauma, hypotension, and bleeding from acute gastric mucosal lesions needs intravenous fluid therapy.

Given the complexity of comparing individual patients with bleeding ulcers, the problem of making all-inclusive statements about such patients sometimes seems futile. However, the clinician has a different problem. He or she has the task of determining which of many possible approaches should be undertaken in the care of an individual patient[9,41]. All decisions must be firmly grounded in the known pathophysiology of the various conditions that result in gastrointestinal hemorrhage. Ideally, the practitioner should have extensive personal experience in the treatment of such patients. As in most areas of medicine there is no substitute for mature judgment.

When reviewing the staggering number of publications concerned with this problem we are always impressed by the diversity of opinion about all aspects of the natural history of bleeding ulcers. Several excellent studies have compared the efficacy of alternative approaches to both diagnosis and treatment of massive hemorrhage[1,2]. Considerable disagreement still exists about approaches to management of these patients[10,11,13,15,17,18,26].

All studies agree that there is considerable mortality in large groups of patients with bleeding ulcers and that no single approach can quarantee a favorable result[6]. A major controversy continues to surround the efficacy of aggressive diagnosis in lowering the mortality of massive upper gastrointestinal hemorrhage. Several recent studies reached the conclusion that endoscopic diagnosis has not affected the mortality[10,11,15,34]. This conclusion must be viewed in the context of the patients studied, since there is great variability in the severity of the hemorrhage and in the number of patients with bleeding esophageal varices or stress ulcers, lesions which have prohibitive mortality as a rule. Whether or not the study is limited to patients who have sustained truly massive hemorrhage is extremely important since the inclusion of many patients with melena alone, without hematemesis or hypotension, will underestimate the value of aggressive measures. Likewise, a great number of patients with stress gastritis or varices, a group with 50 percent mortality, can conceal the effectiveness of prompt diagnosis in lowering the mortality of bleeding duodenal and gastric ulcers.

The age and general medical condition of the patients are difficult to "control" in studies such as these, and it is a fact that most of the patients who die do so because of associated organ failure, although hemorrhage

certainly serves as the precipitating event.

Given this reality, the operating surgeon must be aware of the risk factors in massive hemorrhage so that operation can be recommended at the optimal time for the patients under consideration[19].

The studies previously referred to do not determine another critical factors to what extent endoscopic diagnosis has allowed the clinician to determine that surgical intervention is unavoidable, given the natural history of the lesion. Very large duodenal ulcers, large gastric ulcers, and chronic gastric ulcers are examples of lesions in which care is positively affected by endoscopic diagnosis. If one examines a cohort of such patients the benefits of prompt diagnosis become clear. Modern operative treatment should result in a surgical mortality of 10 percent or less[7,18,24], as opposed to a surgical mortality of 25 to 40 percent in some less favorable series.

Each of us wondered what the precise role of endoscopy should be in the overall management of patients with gastrointestinal bleeding when these devices were introduced; ten years' experience allows us to draw certain conclusions. We have been and are enthusiastic about the role of endoscopic diagnosis in bleeding patients because precise knowledge of the bleeding lesion allows more specific application of surgical therapy, shortens operative time, and helps us avoid operation in those patients who are best treated by nonoperative methods.

More reassuring studies have shown a convincing decrease in the mortality of massive bleeding when an aggressive diagnostic and therapeutic approach was used[18,21]. These studies do not claim that endoscopic examination alone... made the difference; on the contrary, endoscopic diagnosis is only a part of a complex diagnostic and therapeutic process[2,28]. Identification of the bleeding point, adequate volume resuscitation, reference to the patients' age and previous medical history, and frequent assessment of the patient's response to therapy remain the vital factors. It is incorrect and misleading to contend that endoscopic examination in most medical centers is anything more than a diagnostic tool which aids in the selection of appropriate therapy. The advent of therapeutic endoscopy for managing hemorrhage by electrocautery or laser beams may force revision of the previous statement.

When to Operate

Surgeons are often faced with the question "When do you recommend operation for bleeding ulcers?" The obvious answer "When necessary, and at the appropriate time" may seem too pat, but it is meant to suggest that individual factors have to be considered at all times[9].

Patients with massive hemorrhage are at grave risk, however, and frequently require operation in the course of their treatment; this is especially true of those whose bleeding episode is associated with frank shock on admission to the hospital[19,32]. Two types of presentation of hemorrhage bear comment. Type I includes those patients who experience exsanguinating hemorrhage ($\geq$50 ml./minute) and who cannot tolerate any delay in definitive treatment. Type II includes all other types of hemorrhage. Patients with Type I hemorrhage cannot tolerate long delays for diagnostic efforts; likewise they are not candidates for endoscopic examination (except after intubation and resuscitation). Operative exploration in such instances must serve both a diagnostic and therapeutic function (see below). For example, the portacaval shunt performed for bleeding ulcer (mistakenly assumed to be a bleeding varix because varices are present) has small chance of success; the suggested diagnosis must be verified by direct inspection. Patients with type II hemorrhage, the large majority of individuals with massive hemorrhage, are those whose rate of bleeding slows or even stops during or possibly as a result of initial therapy. These patients are best managed by methodical and simultaneous diagnostic and therapeutic maneuvers[6].

Management of Type II Hemorrhage

Many institutions are now organizing a team of physicians to manage all patients with gastrointestinal hemorrhage. The team, consisting of a general surgeon, a medical gastroenterologist and a primary physician, should be notified every time a patient enters the emergency room with a complaint resembling upper gastrointestinal hemorrhage[3]. The general steps in the management of a patient with upper gastrointestinal hemorrhage are given in Table 1. Barium meal is not included as part of the evaluation of upper gastrointestinal hemorrhage: it is accurate only 50 percent of the time and in all instances obscures both endoscopic and angiographic findings.

The patient is usually admitted to the emergency room with a chief complaint of having vomited blood. As the physicians are being notified, the nurses prepare the patient for examination and obtain vital signs. If the patient is in a state of shock, the situation is urgent, and immediate steps are taken to correct hypotension. After presence of hemorrhage has been confirmed, early resuscitation is carried out by rapid colloid or crystalloid infusion through large-bore intravenous portals. Prior history of known ulcer disease, alcholism, or of having taken any medications such as aspirin are especially pertinent. A nasogastric tube is passed; "coffee grounds" or

Table I. General Steps in the Management of Upper
Gastrointestinal Hemorrhage

Confirmation of gastrointestinal hemorrhage

> Adequate resuscitation
> Evacuation of stomach of blood clots and detritus
> Early endoscopy
> Adequate angiography, if indicated
> Conservative measures to control bleeding
> Possible radiologic control of bleeding
> Operation, if necessary

blood-flecked material is not a great cause for alarm since the patient is not bleeding as rapidly as someone with emesis of large amounts of frank blood. The nasogastric tube is removed and an Ewald tube inserted.

There are multiple variations in the tube which may be used, but an Ewald tube is best suited for removal of blood and clots from the stomach. The Ewald tube is vigorously irrigated with one-half iced water and one-half iced saline solution (which need not be sterile) until the returns begin to lighten. If after 30 minutes or so of irrigation it becomes evident that the stomach cannot be cleared of blood, preparations are begun for immediate operation. In more than 75 percent of instances, however, the treatment just described will stop gastrointestinal hemorrhage. Lest the description of the success of lavage seem too enthusiastic mention is made of the invariable presence of 700 & 1000 ml of clot in the stomachs of patients requiring surgical exploration. No tube can empty the stomach of clots if the rate of hemorrhage is too rapid.

When the Ewald returns are pink, the stomach has been evacuated as completely as possible, and the gastrointestinal panendoscope can be inserted. Inspection at this point has been shown to be 90 percent accurate at diagnosing the source of bleeding. If the hemorrhage continues to be rapid, endoscopic examination should not be attempted because it may result in pulmonary aspiration. The course of action at this point is dictated by the patient's history and medical condition, endoscopic findings, angiographic facilities (and immediate availability of a radiologist), and other technical factors. Individuallization of treatment is mandatory[8].

The patient who has had severe trauma or is having a stormy postoperative course (sepsis, fistula, etc.) is likely to have stress ulceration. Hemorrhage in this situation would mandate endoscopy followed by selective angiogram to establish the sites of bleeding. Attempts to control bleeding with selective infusion of vasopressin or by neutralization of intragastric acidity should be made.

At times the surgeon will be pressured to operate blindly upon a patient with ongoing hemorrhage and to have endoscopic examination performed only after the patient has been intubated in the operating suits. Though there are instances in which this may be necessary, an aggressive approach to the therapy of patients with massive hemorrhage will minimize the number of occasions for this approach.

Indications for Operation

The possibility of conservative management of massive gastrointestinal hemorrhage is sometimes overly optimistic. We propose the indications for surgical treatment in Tables II and III: they have passed the test of time, and their efficacy has been proved. Since mortality associated with massive upper gastrointestinal hemorrhage is related to the timing of operation, patients with less than optimal resuscitation should not be operated upon, just as patients should not be permitted to continue bleeding day after day until moribund. Likewise, patients with serious systemic disease can not be allowed to continue bleeding without risking multisystem failure;

Table II. Absolute and Relative Indications for Operation

Absolute Indications

> 1500 ml whole blood replacement during any 24-hour
> period, after initial stabilization
> Continous bleeding for more than 48 hours (24 hours
> in patients older than 50 years of age)
> Recurrent bleeding during vigorous medical therapy
> Coincident bleeding and perforation
> Lesions which invariably continue bleeding (such as
> aortoduodenal fistula)

Table III

Relative Indications

> Age greater than 50 years
> Serious medical problem, especially heart disease
> Severe pain persisting during hemorrhage
> Shortage of available blood because of:
>> Rare blood type
>> Preformed antibodies that make cross-match difficult
>> Patient's refusal to accept transfusion
> Endoscopic demonstration of actively bleeding arterial lesion

in general such patients are operated upon sooner than "healthy" persons.

Preparation for operation—The Transoperative Approach

A. Physiologic considerations

Physiologic preparation is the mainstay of modern surgical treatment and massive hemorrhage provides a dramatic opportunity to maintain cardiopulmonary stability[12]. Cardiac monitoring techniques should include routine use of pulmonary artery catheters when possible, especially in patients older than 60 years of age, the group of patients who have the greatest mortality during bleeding episodes[5,35,38].

Pulmonary care must be directed toward minimizing the chances for aspiration of gastric contents, for alveolar hypoventilation or frank respiratory failure, and for pneumonia or atelectasis postoperatively. Frequent monitoring of respiratory rate and arterial and central venous oxygen tensions allows early recognition of respiratory failure or cardiac insufficiency. Early intubation and institution of positive airway pressure continue to be the most beneficial means of protecting pulmonary function. New devices for achieving positive airway pressure by mask alone without intubation are not without risk in this type of patient, and are not recommended.

Patients who are brought to the operating room in optimal condition will have had adequate volume replacement as determined by blood pressure, pulse and urine output. At times, judicious volume replacement is not accompanied by satisfactory return to normal of these measurements; the usual reason is that resuscitation is lagging behind the rate of bleeding. These patients need two prompt changes in therapy as a rule; the first is an increase in the rate of fluid therapy, and the second is prompt surgical exploration. Such patients probably have unrecognized type I hemorrhage, and procrastination or indecision can be a fatal mistake.

A practice which is recommended for all bleeding patients is the maintenance of a structured flow diagram which records the dynamic aspects of transfusion therapy and the patient's response. Such a hemorrhage sheet can greatly simplify the tabulation of all significant aspects of the hemorrhage and serves as a valuable teaching device for residents, medical students and paramedical personnel.

A note of caution regarding the use of prophylactic antibiotics is in order for patients with massive bleeding. such patients, even if they secrete adequate amounts of acid in the basal state, will have considerable contamination of their normally sterile gastric contents by swallowed bacteria which thrive because the blood in the stomach neutralizes any effect of endogenous acid. Effective antibiotic therapy is best directed against a wide spectrum of aerobic and anaerobic bacteria. Gram-positive bacteria, including Clostridia, may be present in large numbers and are the major pathogens. Beta lactam antibiotics (either the first generation cephalosporins or later modifications) should be given to any patient operated upon, preferably several hours before the operation. This policy implies that any patient who continues to bleed should have an antibiotic given during the first several hours of admission to the hospital. We also recommend Gram stain and culture of gastric contents whenever the stomach is entered.

At the conclusion of the operative procedure the skin and subcutaneous tissues are best left open to eliminate the possibility of subcutaneous wound infection. All of these consideration are especially applicable to patients with gastric ulcer.

B. Psychological Preparation

The surgeon should be aware of the intense strain which massive hemorrhage places on the individual and his family members. The important quality of assurance depends much upon what the surgeon says, how he says it, and his style of management[20]. The surgeon should be firm and understanding, sharing his or her knowledge

with the family so that they know the rationale of the treatment plan. The family should know that the surgeon familiar with all of the conditions that cause bleeding, and that he or she will not spare any effort to correct the condition.

If surgeons do not develop this awareness and ability, then less knowledgable individuals will fill the void, and a further step toward committee medicine will have been taken. We firmly believe that the surgeon is the logical individual to set the tone for all of the events surrounding the bleeding episode, and that the results of the surgeon's efforts—successful or not—will be most acceptable if the surgeon accepts personal responsibility for supervising all aspects of the patient's care.

Plan of Operation

The patient is brought to be operating room, prepared and draped while awake, and intubated. Although "awake" intubation sometimes seems a terrifying experience for the patient it is a less dangerous than a "crash" induction complicated by difficulty intubating the patient or by aspiration of gastric contents. The proper psychological support by the operating room staff during this period is vital; the patient will always remember who held his or her hand or gave him or her an encouraging look when the situation was critical.

A midline incision is desirable, allowing maximal exposure in minimal time with little bleeding; the incision must be adequate for proper exposure. Mechanical retractors can provide excellent, tireless, exposure. This is especially important if the number of surgical assistants is limited.

A. Intraoperative Endoscopy

If for any reason endoscopic examination was impossible preoperatively it is sometimes advantagous to consider such an examination at this time[23]. The operating surgeon will want to know what the esophagus looks like. Are these varices? Are they bleeding? Is there gross esophagitis or a bleeding lesion at the gastroesophageal junction? All of these critical questions are best answered by direct visual examination. Surgeon-endoscopists can accomplish this examination in a few minutes without the attendant risks of aspiration or hypotension which might occur if endoscopic examination were performed under less optimal conditions.

B. Examination of the Abdominal Organs.

Examination of the abdominal mass often provides rapid identification of the source of bleeding[14]. The condition of the liver and the presence of gastric or esophageal varices can be established quickly, though it is important to recognize that simultaneous ulcer or gastritis may be the source of bleeding in 50 percent of the patients with concomitant varices[40]. That is precisely why at some point in the diagnostic process the source of bleeding should be specifically identified in any patient with bleeding varices.

Next, inspection of the gastroesophageal junction, the body and lesser curvature of the stomach, and the duodenum is performed. If subserosal ecchymosis surrounds the gastroesophageal junction, a Mallory-Weiss tear at the gastroesophageal junction should be suspected; such a sign can be expected in 25 to 50 percent of patients with such lesions.

The lesser curvature of the stomach may have a contiguous inflammatory process from a chronic gastric ulcer or a marginal ulcer. Inflammatory reaction and petechial hemorrhage are characteristic in the vicinity of any active ulcer in either the duodenum or stomach.

Following this, digital palpation of the stomach and duodenum, including manual indentation of the anterior wall of these tissues may allow discovery of an ulcer crater on the posterior wall[14]. The induration of chronic pancreatitis should not be mistaken for an ulcer; the hardened pancreas can mimic the presence of an ulcer. The pyloric ring stretched over a swollen pancreas or retrogastric lymph nodes is another source of error.

If none of these investigations reveals the source of bleeding, the next step is a carefully planned gastrotomy. Planning is crucial in this step; the patient should not undergo gastrotomy as a hasty maneuver.

The first opening should be made along the anterior surface of the stomach in a way that allows either closure of the opening after inspection of the mucosa, distal gastrectomy (antrectomy) with tubularization of the gastric remmant, or partial gastrectomy in the manner of Pauchet[29,30]. Figure 2 illustrates a proper initial incision and several which do not lend themselves to subsequent specific operative procedures; the specific operation performed will be determined by the specific condition.

C. No external evidence of bleeding site

The gastrotomy is performed as illustrated after isolation of the stomach by laparotomy pads to minimize contamination of the abdomen. Generous use of electrocautery helps minimize bleeding from the edematous mucosa, and Babcock clamps placed upon mucosal arterioles can control this source of additional bleeding. Manual extraction of the clot is then performed.

Inspection of the mucosa sometimes shows numerous small acute ulcers. Even if several of these ulcers are found it is important to determine whether there is an active source of bleeding within the stomach. This is done by first irrigating residual blood from both the proximal and distal stomach segments, placing moist laparotomy pads in each portion of the stomach, and removing these pads in sequential fashion from each portion of the stomach. The gastroesophageal junction should be checked carefully; the nasogastric tube will provide rapid identification of the gastroesophageal junction, and narrow metal retractors placing upward traction on the anterior gastric wall will allow complete evaluation of this critical area. Any bleeding superficial ulcers are oversewn with silk sutures. Then, thought is given to more definitive treatment of the condition (see below).

If no bleeding sites are found it is sometimes helpful for the surgeon to palpate the gastric tissues between his or her fingers; a small ulcer will sometimes be hidden between folds of mucosa and can be found in this way. Any bleeding chronic gastric ulcer is treated initially in the same manner as the bleeding duodenal ulcer (see below).

If no lesion is found in the stomach, an incision should be made that traverses the pylorus. This incision is made with the possibility of subsequent pyloroplasty in mind. Our choice, therefore, is an incision approximately one centimeter from the greater curvature side of the stomach and duodenum, since we favor the Finney pyloroplasty. The alternate incision midway between greater and lesser curvatures is satisfactory as well, but is not preferred because of difficulty in calibrating the subsequent "ostomy" precisely. With serious early dumping or alkaline reflux gastritis as the complication of too generous openings, the surgeon must be cognizant of the physical size of the connection he or she creates. If a duodenal or pyloric channel ulcer is found it should be carefully examined for the presence of an arterial wall in its base. We perform suture ligation of arteries proximally and distally with 2-0 silk sutures, then pass a "u" stitch beneath the center of the artery to obliterate any anastomosing vessels which might join the posterior wall. A note of caution is sounded regarding ulcers overlying the portal triad; the lumen of the common duct should not be compromised and operative cholangiography should be performed if there is any question of a hemostatic suture impinging upon this structure.

The preceding approach localizes the bleeding in most instances. The surgeon should beware if no bleeding lesion has been found! Such a circumstance requires rapid assessment of other protential sources of hemorrhage, including prosthetic-enteric fistula, pancreato-enteric fistula and hemobilia. If no source of bleeding is found we recommend that the abdomen be closed without any definitive procedure being performed. Just as "blind" gastrectomy is a historical footnote in the treatment of bleeding[36], so also is the vagotomy and pyloroplasty performed without specific indications.

Specific Surgical Therapy

With the source of bleeding controlled, the next step is the performance of the definitive surgical procedure best suited to the bleeding lesion. A few minutes spent in evaluation of the next move are not only well spent but allow the anesthesiologist to correct any circulatory volume deficits.

A. Chronic Gastric Ulcer

The position of the ulcer determines several specific aspects of the operation. Most chronic gastric ulcers are situated on the lesser curvature of the stomach near the incisura; these are excised with ease by the Schoemaker modification of distal gastric resection. This technique is a 40 percent resection with care taken to include the tongue-like projection of antrum along the lesser curvature. Typically, the greater curvature is freed from the gastroepiploic vessels along its distal margin up to the point at which resection will be performed. The gastroduodenal junction is mobilized and a Kocher maneuver elevates the duodenum to assure that the subsequent gastroduodenostomy can be performed without tension.

Then, the right gastric artery is identified and ligated. Look for a convex, pulsatile elevation along the cephalad border of the pylorus to identify this vessel. After division of the duodenum, the limits of gastric resection can be determined. Next, the left gastric artery is divided between clamps. Preliminary spreading maneuvers in this edematous tissue should be avoided; instead, the surgeon should place his or her left hand within the lesser sac with fingers beneath the stomach and the thumb anteriorly. When the surgeon compresses the stomach and withdraws the left hand the lesser curvature will be apparent, and clamps can be applied. Double ligation of the proximal left gastric artery is prudent[25].

A Payr clamp is then applied perpendicularly to the greater curvature of the stomach, encompassing 4.5 to 5.0 cm, of stomach, the exact size required for subsequent anastomsosis. A second Payr clamp or stapling device is inserted from the tip of the first clamp toward the gastroesophageal junction. The only difference in the approach to the bleeding patient is preliminary ligation of the left gastric artery, either through a gastrotomy as described or along the lesser curvature if bleeding is not massive.

The "high" gastric ulcer cannot be encompassed by clamps and is managed best by the Pauchet type of resection. This technique used in the early 1900's differs from the "two clamp" techniques just described in that instead of application of the second clamp, a "free-cut" is made along the anterior surface of the stomach, saving enough of the anterior wall to allow tubularization of the gastric remnant and avoid subtotal gastrectomy[37]. The resulting suture line will "rotate" to the posterior wall of the stomach as shown. The subsequent anastomosis should be neither too large nor too small; a 15–20 mm. opening is perfectly adequate. We prefer the Billroth I anastomosis, but will rarely perform a gastrojejunostomy if some physical factor, such as fatty liver prohibits Billroth I anastomosis without tension.

An alternative treatment for a high-lying gastric ulcer is the distal resection without removal of the ulcer. Kelling and Madlener proposed this operation at the turn of the century, and it is reported to be efficacious. If this distal resection is used, the ulcer bed must be suture-ligated to control bleeding, and frozen section of the margin should be performed to exclude cancer.

No specific recommendation for lesser procedures can be made at this time, although encouraging preliminary results of selective gastric vagotomy and pyloroplasty or highly selective vagotomy alone have been reported, their use must be categorized as experimental. In the patient at extremely poor risk, truncal vagotomy and pyloropylasty with wedge resection of the ulcer can be performed with the realization that recurrence of the ulcer is more likely.

Finally, any gastric ulcer seen is conjunction with a scarred pyloroduodenal area must be viewed as a combined ulcer, and vagotomy must be added to the gastric resection.

　　B.　Chronic Duodenal Ulcer

The operative treatment of bleeding duodenal ulcer must include a procedure to arrest hypersecretion of acid. In our clinic vagotomy is recommended for all such situations. The technique of vagotomy must include a careful search for main and accessory vagal branches. We subscribe to the original technique (which has not received sufficient emphasis in the past) which results in a circumferential area of esophagus completely bared of adventitial-neural tissues[27].

The single most valuable maneuver in performing this type of vagotomy is the identification of the potential space at the anterior wall of the esophagus where the hepatogastric ligament joints the esophagogastric junction. When this landmark is used subsequent baring of the esophagus is performed easily. In patients who have recurrent bleeding duodenal ulcers after previous vagotomy, this plane is often intact and inviolate. A complete vagotomy then can be performed with surprising ease. Likewise, the posterior trunk is often found intact in instances of recurrent bleeding, and care must be taken to guarantee that it is not left intact. Missed vagal nerves and incomplete vagotomy are the cause of most recurrent ulcers.

Resection for Duodenal Ulcer—When is it Necessary

In general, resection is not recommended for the initial treatment of bleeding duodenal ulcers. Complete vagotomy with adequate pyloroplastyis safe, effective, and has less associated morbidity than gastric resection[16,39]. However, there are instances in which resection must be performed: for example, large ulcers which virtually destroy the pyloroduodenal junction. Likewise, recurrent ulcers in the aftermath of complete vagotomy (as determined by repeat exploration) or primary ulcers in which control of the bleeding artery results in irreparable damage to the pyloroduodenal segment require distal gastric resection. Table IV illustrates the common causes of recurrent ulcer.

Table IV.　Classic Causes of Recurrent Duodenal Ulcer

　　　Incomplete vagotomy
　　　Inadequate gastric resection
　　　Retained antrum not in continuity with gastric
　　　　secretions (Billroth II)
　　　Too long afferent limbs
　　　Ulcerogenic tumor of the pancreas
　　　Ingestion of irritating drugs
　　　Unphysiologic operations, such as:
　　　　TV without drainage
　　　　Gastroenterostomy without vagotomy
　　　　Gastroileostomy

In this setting, 25 percent gastrectomy is adequate, and Billroth I reconstuction preferred. If a Billroth II operation is performed (a rare necessity) biopsies of the duodenal margin should be performed to preclude a margin cf retained antral tissue.

The danger zone in any resection for duodenal ulcer is the distal segment containing the ulcer. The surgeon should beware of the large ulcer penetrating the head of the pancreas or portal triad. The base cf such an ulcer should never be resected.

The Strauss manuver, named for the late Alfred Strauss of Chicago is eminently suited to the safe treatment of these penetrating ulcers. The base of the ulcer remains in situ and is excluded from the mainstream and damage to contiguous structures, risk of pancreatitis, or needless hemorrhage is thus avoided. The surgeon should perform this maneuver from the left side of the table, elevating the pyloroduodenum with the left hand, incising the posterior mucosal layer alone under direct vision.

C. Stress Ulcers—Acute Gastric Mucosal Lesions

Surgical treatment is a last resort for such lesions, and the procedure of choice is debatable[4,22,32]. There is little question that total gastrectomy or near total gastrectomy or near total gastrectomy will stop the hemorrhage. However, the associated mortality risk is so great that routine use of the procedure cannot be recommended. Alternatives such as vagotomy and pylcroplasty with oversewing of bleeding lesions are as effective in general as any procedure and must be considered. A more recent innovation which is also less risky than massive resection is ligation of all major arteries to the stomach[33]. While not as attractive in terms of definitive treatment as some other cperations, the minimal morbidity dces much to recommend the procedure.

The surgeon who manages a patient with gastrointestinal hemorrhage must be aware of all the options for treatment of a given lesion. It is impossible to state "a priori" which procedure must be employed when operation is necessary. The patient's age, the presence cf additional organ pathclogy, and the previous experience of the surgeon must all be considered.

In all probability, massive upper gastrointestinal hemorrhage will continue to occur in all age groups; the surgeon can have a pcsitive effect on the morbidity cf massive hemorrhage by operating at "just the right time" and by performing an operation tailored to the specific patient.

Careful consideration must be given to cardiac, respiratcry, renal physiology in order to avoid multisystem failure. Furthermore, infectious complications must be anticipated and prevented where possible.

By attention to all of the possible systemic complications in patients with gastrointestinal hemorrhage we can provide optimal treatment for this critical problem.

<div align="center">SUMMARY</div>

Massive upper gastrointestinal hemorrhage is a frequent occurence in almost any hospital setting. Because the patients affected are often chronically ill, and because of the serious physiologic consequences of massive bleeding, the surgeon must be prepared to treat all cf the associated problems which may arise.

There are well established "rules" which help decide when an operation is indicated. Once this point has been reached, a careful and thorough exploratory laparotomy can identify the source of bleeding, even if a pre-operative diagnosis is not available.

The role of gastrointestinal endoscopy is still controversial; it is best viewed as a valuable adjunct in the aggressive evaluation of patients with bleeding, and an important part of a comprehensive treatment program. Endoscopic diagnosis must be combined with surgical judgment in treating the individual patient.

Operative therapy is tailored to the patient and to the bleeding lesion. There is a general tendency to avoid resection, or resect "less" when possible, to avoid the prohibitive mortality generally associated with massive resection.

By attention to the many details associated with gastrointestinal hemorrhage. The morbidity of a bleeding episode can be reduced. One must be aware of the high mortality in most series of patients with bleeding and do everything possible to prevent it.

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