This is one of a series of statements discussing the use of GI endoscopy in common clinical situations. The Standards of Practice Committee of the American Society for Gastrointestinal Endoscopy prepared this text. In preparing this guideline, a MEDLINE search was performed; additional references were obtained from the bibliographies of the identified articles and from recommendations of expert consultants. When little or no data exist from well-designed prospective trials, emphasis is given to results from large series and reports from recognized experts.

Guidelines for appropriate use of endoscopy are based on a critical review of the available data and expert consensus. Further controlled clinical studies are needed to clarify aspects of this statement, and revision may be necessary as new data appear. Clinical consideration may justify a course of action at variance to these recommendations.

INTRODUCTION

Upper-GI bleeding (UGIB) results in over 300,000 hospital admissions annually in the United States, with a mortality of 7% to 10%. This guideline focuses on the role of GI endoscopy in patients with acute non-variceal upper-GI hemorrhage. This guideline will not address chronic GI blood loss or bleeding secondary to portal hypertension. An annotated algorithmic approach to UGIB has recently been published.

DEFINITION

Upper-GI bleeding refers to GI blood loss whose origin is proximal to the ligament of Treitz. Acute UGIB can manifest as hematemesis, “coffee ground” emesis, the return of red blood via a nasogastric tube, and/or melena with or without hemodynamic compromise. Hematochezia (bright red blood per rectum) may occur in patients with extremely brisk UGIB.

INITIAL ASSESSMENT AND TREATMENT

Patients with UGIB should undergo stabilization and resuscitation before the initiation of endoscopic therapy. The initial assessment should focus on the patient’s vital signs, the presence or the absence of hypovolemia and/or shock, and other medical comorbidities. A thorough review of any medications the patient may be taking, with special attention to the use of anticoagulants, antiplatelet agents, or medications associated with GI hemorrhage (e.g., non-steroidal anti-inflammatory drugs [NSAID]) should be performed.

Initially, crystalloid fluids should be infused to maintain adequate blood pressure. Patients with evidence of severe hypovolemia, shock, or ongoing blood loss manifesting as hematemesis or frequent melena should be admitted to an intensive care setting. Blood products such as packed red blood cells should be transfused in patients with evidence of ongoing active blood loss or patients who have experienced significant blood loss or cardiac ischemia. Antisecretory therapy with a proton pump inhibitor (PPI) is warranted, and this can be done intravenously or orally. Patients with ongoing, significant hematemesis or those who may not be able to protect their airway for any reason and are at risk for aspiration should be considered for endotracheal intubation before undergoing endoscopy.

The role of PPI use in patients with acute UGIB has been extensively studied. These studies are largely from outside of the United States and focused on the use of intravenous (IV) omeprazole. A recent review of these studies found that PPI therapy was warranted in all patients with UGIB severe enough to require endoscopic therapy and recommended considering PPI therapy in patients with suspected peptic ulcer bleeding associated with hemodynamic instability, patients in whom endoscopic evaluation is delayed or unavailable, and/or those who require blood transfusion. Furthermore, a recent study comparing IV omeprazole to IV omeprazole plus endoscopic therapy in patients with UGIB and non-bleeding visible vessel or adherent clot showed that patients in the combination therapy group experience fewer episodes of recurrent bleeding and had lower blood transfusion requirements. In the United States, the only PPI approved for IV dosing is pantoprazole, but the optimal dosing regimen for UGIB has yet to be defined. Oral omeprazole, 40 mg administered every 12 hours for 5 days, was effective in reducing bleeding
and the need for surgery in a randomized, placebo-controlled study of patients with peptic ulcer disease (PUD). There are no studies comparing oral with IV PPI administration.

Somatostatin and its analogue octreotide reduce portal venous blood flow and arterial flow to the stomach and the duodenum, while preserving renal arterial flow. Fourteen studies in 1829 patients with non-variceal UGIB were summarized by a meta-analysis that concluded that somatostatin or octreotide reduced the risk of continued bleeding and the need for surgery, and that these agents are more effective in peptic ulcer bleeding than for non-peptic ulcer bleeding (i.e., hemorrhagic gastritis). These agents may be considered as an adjunct treatment before endoscopy or when upper endoscopy is unsuccessful, contraindicated, or unavailable.

Clinical features associated with a high risk of recurrent bleeding, need for surgery, and increased mortality are listed in Table 1.

**ROLE AND EFFECTIVENESS OF ENDOSCOPY IN THE MANAGEMENT OF UGIB**

Endoscopy in patients with UGIB is effective in diagnosing and treating most causes of UGIB and is associated with a reduction in blood transfusion requirements and length of intensive care unit and total hospital stay. Early endoscopy (within 24 hours of hospital admission) has a greater impact than later endoscopy on length of hospital stay and requirements for blood transfusion. In appropriate settings, endoscopy can be used to assess the need for inpatient admission. When evaluated in emergency room settings, up to 46% of hemodynamically stable patients who are evaluated for UGIB with upper endoscopy and subsequently are found to have low-risk stigmata for recurrent bleeding can be safely discharged and followed as outpatients.

Intravenous erythromycin (250 mg IV bolus or 3 mg/kg over 30 minutes) 30 to 90 minutes before EGD promotes gastric motility and emptying of gastric contents and can significantly improve the quality of the examination with regard to mucosal visibility.

**ENDOSCOPIC PROGNOSTIC FEATURES**

Several endoscopic findings most closely associated with PUD but sometimes seen with other causes of UGIB (e.g., severe esophagitis with ulceration), have been associated with specific recurrent bleeding rates and, thus, the need for endoscopic therapy (see Table 2). Adherent clot seen in an ulcer has been a source of controversy with regard to the need for endoscopic treatment, but recent data has shown benefit to endoscopic clot removal and treatment of an underlying lesion instead of observation alone. Flat, pigmented spots or lesions with slow oozing of blood without other stigmata have not been definitively shown to benefit from endoscopic therapy. Clean-based ulcers have an extremely low recurrent bleeding rate and do not require endoscopic treatment.

**Endoscopic treatment modalities for GI hemorrhage**

**Injection methods.** The method of action of injection therapy is primary tamponade because of volume effect, with some agents having a secondary pharmacologic effect. Agents available for injection to produce tamponade include normal saline solution and epinephrine (adrenaline). Sclerosants such as ethanol, ethanolaamine, and polidocanol are not used to produce tamponade but instead cause direct tissue injury and thrombosis. Agents also can be used in combination (such as epinephrine followed by ethanolaamine). Limited data suggest that higher volumes

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### Table 1. Clinical risk factors for poor outcomes*

<table>
<thead>
<tr>
<th>Risk Factor</th>
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<tbody>
<tr>
<td>Older age (&gt;60 y)</td>
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<tr>
<td>Severe comorbidity</td>
</tr>
<tr>
<td>Active bleeding (witnessed hematemesis, red blood per nasogastric tube, hematochezia)</td>
</tr>
<tr>
<td>Hypotension or shock</td>
</tr>
<tr>
<td>Red blood cell transfusion ≥6 units</td>
</tr>
<tr>
<td>Inpatient status at time of bleed</td>
</tr>
<tr>
<td>Severe coagulopathy</td>
</tr>
</tbody>
</table>

*Recurrent bleeding, need for endoscopic hemostasis or surgery, or mortality.

### Table 2. Stigmata of ulcer hemorrhage and risk of recurrent bleeding without endoscopic therapy

<table>
<thead>
<tr>
<th>Stigmata</th>
<th>Risk of recurrent bleeding without therapy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active arterial (spurting) bleeding</td>
<td>Approaches 100%</td>
</tr>
<tr>
<td>Non-bleeding visible vessel ('pigmented protuberance')</td>
<td>Up to 50%</td>
</tr>
<tr>
<td>Non-bleeding adherent clot</td>
<td>30%-35%</td>
</tr>
<tr>
<td>Ulcer oozing (without other stigmata)</td>
<td>10%-27%</td>
</tr>
<tr>
<td>Flat spots</td>
<td>&lt;8%</td>
</tr>
<tr>
<td>Clean-based ulcers</td>
<td>&lt;3%</td>
</tr>
</tbody>
</table>

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of epinephrine injected at endoscopy have a superior effect in achieving hemostasis. A separate class of injectable agents includes thrombin, fibrin, and cyanoacrylate glues, which are used to create a primary tissue seal at a bleeding site. Thrombin has been used in several studies in conjunction with heat probe therapy and epinephrine injection, but, only one of these studies (by using thrombin combined with epinephrine) showed any additional benefit conferred by the addition of thrombin. No prospective randomized trials of thrombin monotherapy have been performed.

Cautery. Cautery devices include heat probes, neodymium-yttrium aluminum garnet lasers, argon plasma coagulation (APC), and electrocautery probes. Laser therapy is not widely used in many centers because of cost, training, and support issues. Electrocautery refers to the use of monopolar electrocautery or bipolar (multipolar) electrocautery. Heat probes and electrocautery probes also use local tamponade (mechanical pressure of the probe tip at/ on the bleeding site) combined with heat or electrical current to coagulate (and thus close) the vessel in question, a process known as coaptation. Argon plasma coagulation uses a stream of ionized gas to conduct electricity resulting in coagulation of superficial tissues. Argon plasma coagulation is primarily used for the treatment of superficial lesions, such as vascular abnormalities, but may have a role in some patients with bleeding from other causes.

Mechanical therapy. Mechanical therapy refers to the implantation of a device that causes physical tamponade of a bleeding site. Currently, the only mechanical therapies widely available are endoscopically placed clips and band ligation devices. Endoscopic clips usually are placed over a bleeding site (e.g., visible vessel) and left in place. Clips currently are available in two or three pronged configurations, can be affixed to bleeding sites, and typically slough off days to weeks after placement. Endoscopic band ligation devices, commonly used in variceal bleeding, also have been used to treat non-variceal causes of bleeding and involve the placement of elastic bands over tissue to produce mechanical compression and tamponade.

OVERVIEW OF ENDOSCOPIC APPROACHES TO COMMON CAUSES OF ACUTE UGIB

In patients with UGIB, the most common etiologies are as follows: PUD (35%-50%), gastroduodenal erosions (8%-15%), esophagitis (5%-15%), varices (5%-10%), Mallory-Weiss tear (15%), vascular malformations (5%), with other conditions (e.g., malignancy) making up the remaining cases.

PUD

Peptic ulcer disease represents the most common cause of UGIB, accounting for a third to a half of all episodes. The most frequent causes of PUD are NSAIDs and Helicobacter pylori infection, although a variety of other clinical settings can predispose patients to PUD.

Endoscopic therapy for patients with UGIB caused by PUD has been studied in randomized, controlled trials. Laser therapy; monopolar electrocautery; bipolar electrocautery; heat probe; epinephrine injection; and epinephrine injection with additives, such as the sclerosants ethanolamine and polidocanol, are all effective when compared with no therapy or sham therapy.

Numerous prospective randomized studies of endoscopic treatment methods have been performed. No single modality has been shown to be superior for treating UGIB caused by PUD. For epinephrine injection, the addition of a second modality (combination therapy) reduces further bleeding, the need for surgery, and mortality. Operator experience plays a significant role in modality choice and in achieving hemostasis.

All patients with PUD should undergo diagnostic testing for H pylori infection. In the setting of active bleeding, rapid urease tests have reduced sensitivity and cannot be relied upon to rule out infection. All patients with positive test results should be treated to eradicate infection. Patients with PUD and H pylori infection who undergo treatment for infection have a significantly lower risk of recurrent bleeding than those who only receive antisecretory therapy.

Esophageal lesions

Esophagitis, a common cause of UGIB, can be caused by gastroesophageal reflux, infection, medications, caustic ingestion, or radiation. In the majority of patients, no endoscopic therapy is required.

A Mallory-Weiss tear is a laceration of the mucosa at the gastroesophageal junction, gastric cardia, or distal esophagus. Bleeding is most commonly self-limited. Patients with ongoing or severe bleeding require endoscopic therapy. Multipolar electrocautery appears to be the most effective therapy, but epinephrine injection, clips, or band ligation also appear to be effective. Uncontrolled bleeding may require angiographic therapy or surgery.

Vascular abnormalities

Vascular malformations typically cause microscopic chronic blood loss and, occasionally, acute GI hemorrhage. These lesions can occur sporadically or in association with other disorders: cirrhosis, renal...
failure, radiation injury, various collagen vascular diseases, and hereditary hemorrhagic telangiectasia (Osler-Weber-Rendu disease). Endoscopic ligation, laser, APC, contact cautery, and sclerotherapy have been reported to be effective. There are no prospective trials comparing treatment methods for acute UGIB caused by vascular malformations.

Dieulafoy’s lesion typically presents with intermittent, recurrent UGIB. The lesion occurs when an abnormally large-caliber submucosal artery becomes exposed at the surface of the mucosa and then ruptures, usually in the stomach, but also in the small bowel. Endoscopic methods to treat Dieulafoy’s lesion include banding, clipping, electrocautery, cyanoacrylate glue, sclerosant injection, epinephrine injection, heat probe, banding, and laser therapy. Large single-center experiences have not identified one modality as being superior to others, and no prospective randomized trials have been published. Epinephrine injection monotherapy is associated with a higher rate of recurrent bleeding. Tattooing of the lesion should be considered to facilitate future treatment should recurrent bleeding occur. If endoscopic treatment is successful, recurrence of bleeding at the same site is rare. If endoscopic therapy fails, interventional radiology or surgical approaches may be required.

**Aortoenteric fistulas**

Aortoenteric fistulas may be primary (caused by arteriosclerosis, aortic aneurysms, aortic infections), or secondary (aortic repair with implantation of a synthetic graft). Most aortoenteric fistulas occur at the level of the distal duodenum or the jejunum, which may be beyond the reach of a standard upper endoscope. Aortic graft material may be seen protruding into the bowel lumen. CT scans and angiography sometimes demonstrate the fistula if contrast can be seen extravasating into the bowel. There is no endoscopic therapy for aortoenteric fistula. Surgery is the only definitive treatment.

**GI tumors**

Benign or malignant GI tumors, whether primary or metastatic, cause approximately 5% of cases of UGIB. Case series of endoscopic therapy have reported initial hemostasis rates similar to or lower than that seen in PUD, but recurrent bleeding rates were high, between 16% and 80%. Procedure-related complications also were more frequent. The optimal treatment modality has not been defined. Surgery or angiography may be better approaches to ensuring long-term hemostasis. Any lesion appearing malignant when seen in the context of an episode of UGIB should be biopsied.

**RECURRENT BLEEDING AFTER ENDOSCOPIC TREATMENT**

Despite adequate initial endoscopic therapy, recurrent bleeding in patients with UGIB can occur in up to 24% of high-risk patients, although more recent studies that emphasize the use of PPI therapy in addition to combination endoscopic therapy show recurrent bleeding rates of approximately 10%. Patients with recurrent bleeding respond favorably to repeat endoscopic therapy. Scheduled repeat endoscopy (e.g., at 24 hours) has been advocated for patients with high-risk stigmata that were treated at the time of the initial bleed. Retrospective and prospective studies have suggested that scheduled repeat endoscopy reduces recurrent bleeding rates and may be cost effective in these patients. The precise role of scheduled repeat endoscopy has yet to be defined.

**SUMMARY**

- The initial management of UGIB is patient assessment and stabilization with volume resuscitation.
- High-risk patients are those with hematemesis, hemodynamic instability, coagulopathy, renal failure, older age, and multiple comorbidities; these patients require more intensive monitoring.
- Antisecretory therapy with PPIs is recommended for patients with bleeding caused by peptic ulcers or in those with suspected peptic ulcer bleeding in whom endoscopy is delayed or unavailable.
- Preprocedure erythromycin improves mucosal visibility.
- While not part of the routine management of nonvariceal UGIB, somatostatin or octreotide can reduce the risk of continued bleeding and the need for surgery but should be viewed as an adjunct to endoscopic and PPI therapy.
- Endoscopy is effective in the diagnosis and the treatment of UGIB.
- Endoscopic stigmata that predict a high risk of recurrent bleeding in PUD are active spurting, a visible vessel, and an adherent clot; these lesions should be treated.
- Patients with low-risk lesions can be considered for outpatient treatment.
- Available endoscopic treatment modalities include injection, cautery, and mechanical therapies.
- Studies have not demonstrated clear superiority of any one endoscopic treatment modality, although...
epinephrine injection alone is inferior to combination therapy for peptic ulcer bleeding. (A)

- Scheduled repeat endoscopy in patients at high-risk for recurrent bleeding may be beneficial but its role has yet to be defined. (A)
- Patients with PUD should be tested and treated for Helicobacter pylori. (A)

REFERENCES


6. Goto H, Ohta S, Yamaguchi Y, Yukioka T, Matsuda H, Shimazaki S. Prospective evaluation of hemoclip application with injection of epinephrine in hypertonic saline solution for...
hemostasis in unstable patients with shock caused by upper GI bleeding. Gastrointest Endosc 2002;56:78-82.


73. Sharma VK, Sahai AV, Corder FA, Howden CW. Helicobacter pylori eradication is superior to ulcer healing with or without maintenance therapy to prevent further ulcer haemorrhage. Aliment Pharmacol Ther 2001;15:1939-47.


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