Chapter 2
Urgent Workup for Upper Gastrointestinal Bleeding

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Introduction

Recall that upper gastrointestinal bleeding (UGIB) refers to blood loss originating from within the alimentary tract proximal to the ligament of Treitz. Workup of a patient presenting with an UGIB should proceed down an algorithm based on common sense and evidence based guidelines. First and foremost, the patient should be stabilized and adequately resuscitated. A focused history and physical exam should ensue to help identify the source of bleeding as well as pertinent complicating factors, such as comorbid disease and medications. Scoring systems can be used to risk stratify patients and further direct disposition and diagnostic and/or therapeutic interventions. This chapter addresses the initial workup of patients who present with acute UGIB requiring inpatient management, but many of the same principles apply to other degrees of UGIB.

Initial Assessment

The first priority in managing UGIB is to stabilize and resuscitate the patient. The previous chapter reviews this process in depth. Briefly, the examiner must rapidly assess the airway, breathing, and circulation and be prepared to institute critical care measures such as intubation, insertion of large bore intravenous lines, and goal-directed resuscitation. Concurrently, blood should be drawn to examine cell counts, chemistries (including liver and renal panels), and coagulation markers (INR and aPTT). A type and screen should be obtained in anticipation of transfusion. Basic

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A.D. Pryor et al. (eds.), *Gastrointestinal Bleeding*,
DOI 10.1007/978-3-319-40646-6_2

laboratory tests not only help guide goal-directed resuscitation but also provide insight into bleeding diatheses such as liver or renal failure. More specific laboratory tests should be drawn if indicated; for instance, given the high prevalence of *H. pylori* in peptic ulcer disease and the availability of effective treatment regimens, specific testing should be done in patients with bleeding peptic ulcers.

The examiner should also perform a focused history and physical to identify complicating factors and to further clarify the diagnosis/prognosis. The examiner should start by asking about prior bleeding episodes and common underlying causes, such as peptic ulcer disease (31–67 %), gastritis (7–31 %), and varices (4–20 %) [1]. Known liver disease ± alcohol abuse, aortic graft, *H. pylori* infection, and gastroenteric anastomosis should raise the specter of varices, aorto-enteric fistula, PUD, and marginal ulcer, respectively. Moreover, one or more comorbid conditions are present in roughly two-thirds of patients with UGIB. Cirrhosis, renal failure, and coagulopathies are independent risk factors for UGIB. The relative risk of death is higher for hepatic, renal, and malignant disease than for cardiopulmonary disease and diabetes [1]. As noted in the prior chapter, it is important to review medications for NSAIDs, antiplatelet agents, and anticoagulants as well as steroids, acid suppression agents, and beta-blockers.

The physical exam should attempt to reveal stigmata of the underlying disease process and signs of an acute abdomen warranting urgent or emergent surgery. Patients with UGIB may present with postural hypotension, anemia, hematemesis, hematochezia, or melena. Significant hematemesis plus jaundice, ascites, spider angiomata, asterixis, and/or hepatosplenomegaly implicate varices; epigastric tenderness and coffee ground emesis implicate peptic ulcer disease or a Mallory–Weiss tear; cachexia and a palpable mass implicate malignancy.

An integral part of the history and physical is to rule out alternate diagnoses. For instance, epistaxis or red colored food/drink can mimic hematemesis; bismuth medications can mimic melena; and red meat, turnips, and horseradish can produce false-positive fecal occult blood tests. Of course, lower gastrointestinal bleeding should also be on the differential.

Risk Stratification

In addition to guiding resuscitation and diagnosis, the initial assessment should determine interventional needs and immediate disposition. While no single factor can reliably predict the need for intervention there are two commonly employed scoring systems that can identify patients at risk for death, rebleeding, and clinical intervention: the Blatchford Score [2] and the Rockall Score [3]. The Blatchford Score (Table 2.1) was designed to identify patients requiring intervention based on simple clinical and laboratory findings. It does not require endoscopy and can be calculated at an early stage of triage. Patients with a score of 0 can be safely discharged for outpatient management. The Rockall Score

Table 2.1 Blatchford scoring system

Admission risk marker	Score
Blood urea (mmol/L)	
≥6.5 < 8.0	2
≥8.0 < 10.0	3
≥10.0 < 25	4
≥25	6
Hemoglobin (g/L) for men	
≥120 < 130	1
≥100 < 120	3
<100	6
Hemoglobin (g/L) for women	
≥100 < 120	1
<100	6
Systolic blood pressure (mmHg)	
100–109	1
90–99	2
<90	3
Other markers	
Pulse ≥100 (per min)	1
Presentation with melena	1
Presentation with syncope	2
Hepatic disease	2
Cardiac failure	2

Table 2.2 Rockall (full) scoring system

	Score			
Variable	0	1	2	3
Age	<60	60–79	≥80	
Shock	Systolic BP ≥100, pulse <100	Systolic BP ≥100, pulse ≥100	Systolic BP <100	
Comorbidity	No majors		Cardiac failure, ischemic heart disease, other unlisted majors	Renal failure, liver failure, disseminated malignancy
Diagnosis on endoscopy	Mallory–Weiss; none	All other diagnoses	UGI Malignancy	
Major stigmata of recent hemorrhage	None or dark spot only		Blood in UGI tract, adherent clot, visible or spurting vessel	

(Table 2.2) was designed to identify patients at risk of death. The full score can only be calculated after endoscopy but there is a "clinical" or "pre-endoscopy" version as well [4]. Patients with a low Rockall score (0, 1, or 2) have a less than 5 % risk of rebleeding and mortality is virtually zero, even if there is a rebleed. In contrast, patients with a high Rockall score (8 or greater) have a 40 % risk of rebleeding and their mortality is as high as 41 % [3]. While both studies have been validated alone and head-to-head, the quality of evidence is low and therefore neither should supersede clinical acumen.

Nasogastric Lavage

While nasogastric lavage can be used as an adjunct for diagnosis and visualization, it should not delay additional workup and treatment. According to a Canadian UGIB registry, active bleeding or a non-bleeding visible vessel were seen on endoscopy in 45 % of patients with bloody aspirates, 23 % of patients with coffee-ground aspirates, and 15 % of patients with clear/bile-stained aspirates [5]. This confirms the marginal sensitivity of NG lavage as a diagnostic test. However, a prospective randomized study showed patients with bloody aspirate had reduced transfusion requirements and hospital length of stay after early (<12 h of arrival) endoscopy [6]. In other words, frankly bloody aspirate correlates with high risk lesions which should be intervened upon in a timely manner. As for visualization, a small randomized study comparing lavage via a 40 French orogastric tube versus no lavage demonstrated better visualization but no difference in any meaningful clinical endpoints (e.g., hemostasis, recurrent bleeding, death) [7]. Ultimately, insertion of a nasogastric tube is more likely to cause patient discomfort and delay more appropriate care than to provide novel benefits in most patients; that said, lavage may prompt earlier endoscopy in stable patients with occult bleeding.

Esophagogastroduodenoscopy (EGD)

Esophagogastroduodenoscopy is the primary method of evaluating patients with known or suspected UGIB. EGD has a reported sensitivity of 92–98 % and specificity of 30–100 % [8]. The American Society of Gastrointestinal Endoscopy (ASGE) suggests that early upper endoscopy is a critical step in the workup of a patient with UGIB. An early upper endoscopy allows for diagnosis of esophagitis (Fig.2.1), localization and diagnosis of the source of bleeding, risk stratification of recurrence based on the appearance of the lesion, and potential therapy [9].

The consensus amongst major guidelines is that upper endoscopy should be performed within 24 h of presentation [4, 10, 11], but the optimal time point within this window remains under debate. There are numerous clinical trials and observational studies (NB: these studies have disparate inclusion/exclusion criteria, rigor, and end

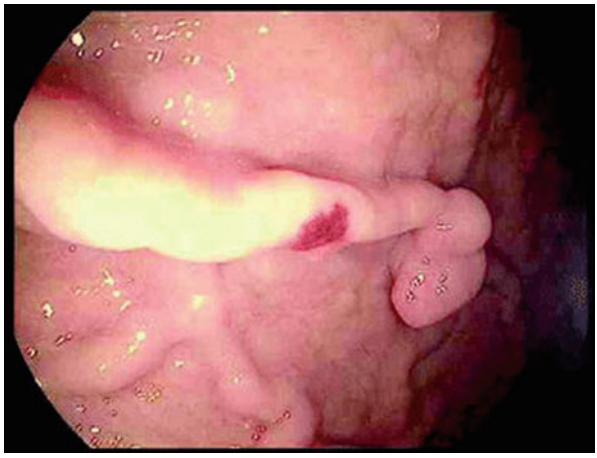

Fig. 2.1 Patient with evidence of esophagitis on EGD

points) that inform this debate, most of which are summarized by two systematic reviews [12, 13]. There is low-level evidence to suggest endoscopy within 12 h of presentation in "high risk" patients lowers mortality and reduces transfusion requirements. There are no clinical benefits—including reduction in rebleeding, length of stay, and additional interventions—to early endoscopy for "low risk" patients. In fact, 40–45 % of low risk patients are candidates for early discharge after endoscopy [10]. However, allocating resources for around-the-clock emergent endoscopy that is unlikely to provide clinical value requires complex financial and behavioral considerations outside the scope of this text. In summary, the current recommendation is to perform EGD in all patients with UGIB within 24 h. In those with persistent bleeding or high risk scores, endoscopy should be performed as soon as it is safe [9].

Patients who experience persistent or recurrent bleeding after initial endoscopy should undergo repeat endoscopy, but routine second-look endoscopy provides no clinical benefit. Up to 24 % of high risk patients will have further bleeding [11] of which 73 % can be successfully treated with repeat endoscopy [14]. Those who progress to surgery for uncontrolled bleeding have a reported postoperative mortality of 30 %, mostly from decompensation of a medical comorbidity or operative complication, such as leak [4]. Therefore, the clinical team should repeat endoscopy or consider interventional radiology in the case of recurrent or uncontrolled bleeding, keeping in mind that failure to achieve control of bleeding will lead to the need for emergent salvage surgery.

In spite of the excellent results with EGD, the procedure is not without complications. It can cause gastrointestinal perforations, further bleeding, aspiration pneumonia, respiratory arrest, and cardiovascular complications [15]. The incidence of complications is low, but it is important to be certain that the benefit of the procedure outweighs the risk.

Table 2.3 Forrest classification of peptic ulcers

Type	Description (prevalence)
Ia	Active spurting bleeding (12 %)
Ib	Active oozing bleeding (included above)
IIa	Non-bleeding but visible vessel (8 %)
IIb	Non-bleeding with adherent clot (8 %)
IIc	Non-bleeding with pigmented ulcer base (16 %)
III	Clean base, no sign of bleeding (55 %)

Endoscopic Findings

During endoscopy the examiner should look for a culprit lesion and associated characteristics that suggest the likelihood of recurrent bleeding. Forrest [16] classified peptic ulcers according to features that were associated with risk of rebleeding (see Table 2.3). They are classified as Ia–III, with lesions in higher groups showing a decrease in risk of recurrence. The first group contains the actively bleeding ulcers (I). This group is further separated into vessels that are either spurting (Ia) or oozing (Ib). The second group includes the non-actively bleeding ulcers. This group is further broken down into three groups: non-bleeding but visible vessel (IIa), ulcer with surface clot (IIb), or ulcer with pigmented spots (IIc). Forrest group III includes ulcers with a clean base [16]. Laine and Peterson looked at thousands of patients with bleeding peptic ulcers and determined their prevalence, rate of further bleeding, and mortality associated with the lesions. They found that most ulcers with a clean base, are associated with a 5 % risk of rebleed and 2 % mortality. Patients with ulcers that have a flat, pigmented spot on endoscopy have a 10 % risk of further bleeding and 3 % mortality. The presence of adherent clots on top of an ulcer is associated with a 22 % risk of further bleeding and 7 % mortality. A visible, non-bleeding vessel is correlated with a 43 % risk of rebleed and 11 % mortality, while actively bleeding vessels have the highest risk of recurrence at about 55 % and a mortality of 11 % [17]. Other lesions such as Mallory–Weiss tears are associated with a low risk (2 %) of further bleeding [18]. These associations suggest that proper evaluation via endoscopy is crucial, as endoscopic findings are directly associated with patients' prognosis and therefore will aid in decisions concerning therapy.

EGD is the first-line diagnostic and therapeutic tool in patients with evidence of UGIB. Endoscopic therapeutic options such as vasoactive injections, sclerotherapy, heat probes, and hemoclipping are discussed in detail in a later chapter.

Arteriography

In 80–90 % of cases an EGD is the only procedure necessary to localize and treat the source of UGI bleeding [19, 20]. The remaining lesions may be elusive to the endoscopist for many reasons, such as structural abnormalities (i.e., strictures or postsurgical

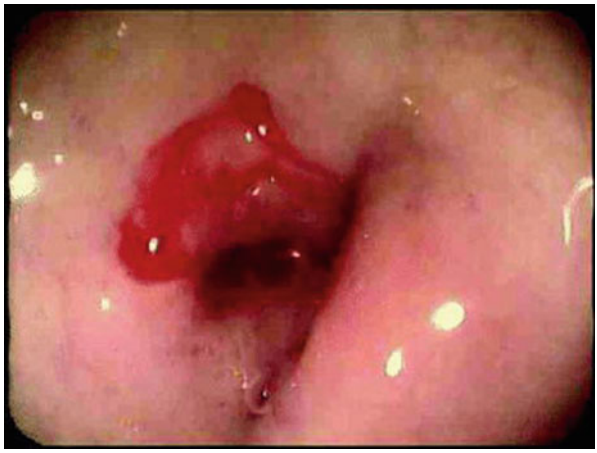

Fig. 2.2 Endoscopy revealing an arteriovenous malformation (AVM)

changes [20]), obscure pathology (i.e., angiodysplasias, arteriovenous malformations, gastric antral vascular ectasias (GAVE), portal hypertensive gastropathy, Dieulafoy lesions [21]), or poor visualization from luminal blood. When an EGD is unable to locate the source of bleeding, a catheter arteriogram is frequently helpful.

Arteriography is an invasive, contrasted radiologic study that can identify briskly bleeding lesions—that is, when the bleeding rate is 0.5–1 mL/min or greater. In the setting of upper GI bleeding, arteriography is positive for extravasation or abnormal mucosal blush in up to 61 % of cases [20]. Some suggest that it has utility in locating structural abnormalities that may not be actively bleeding, such as angiodysplasias, arteriovenous malformations (Fig. 2.2), tumors, or inflammatory lesions [21]. Alternatively, provocative angiography with heparin, thrombolytics, or vasodilators can increase the yield of the study.

In the detection of the source of upper GI bleeding, selective angiography focuses on the celiac axis [20]. Percutaneous access of the femoral artery is obtained via Seldinger technique. A 5F catheter is placed under fluoroscopic guidance into the celiac artery and the superior mesenteric artery. The inferior mesenteric artery is frequently examined to rule out lower gastrointestinal source for bleed as well [20, 21]. Bleeding from the left gastric artery, splenic artery, its closely associated short gastrics, the common hepatic artery, and the gastroduodenal artery can be observed. A positive study is seen as an extravasation of contrast into the bowel lumen or as an abnormal blush. A duodenal ulcer may present as a non-bleeding ulcer (Fig. 2.3) or a bleeding ulcer. Bleeding can occur due to erosion into the gastroduodenal, which may be seen as extravasation around that artery. Embolization of the gastroduodenal artery distal to its take-off from the proper hepatic artery can control bleeding from a duodenal ulcer (Fig. 2.4a, b). Arteriography can also be helpful with the diagnosis of hemorrhagic/stress gastritis, which is a very important diagnosis in ICU patients. On arteriography, one may see multiple small foci of extravasation in a diffusely hypervascular gastric mucosa [19]. A bleeding left gastric artery, associated with a Mallory–Weiss tear, can be seen on arteriogram as well. Once the source of bleeding has been discovered, transcatheter interventions,

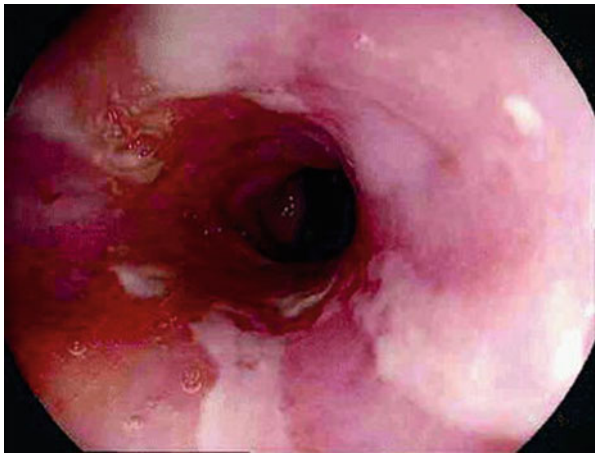

Fig. 2.3 Patient with endoscopic evidence of a non-bleeding duodenal ulcer

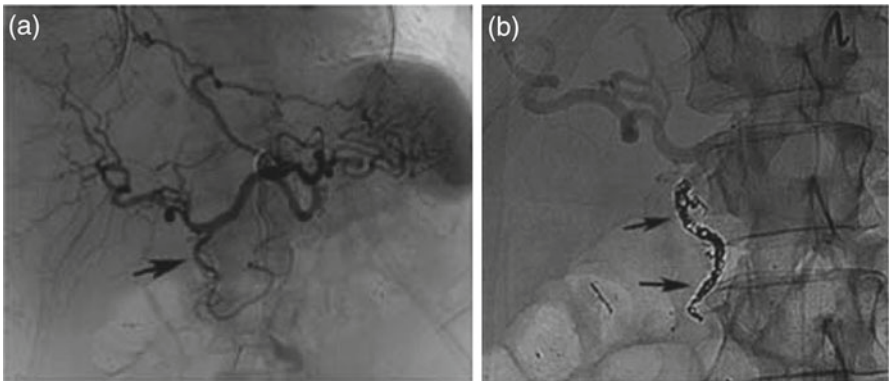

Fig. 2.4 (**a**) Arteriogram of a patient with bleeding from a duodenal ulcer after celiac injection. There was continued bleeding in spite of endoscopic clipping and injection of epinephrine into ulcer bed. The *arrow* indicates gastroduodenal artery with no active extravasation. The clip noticed on fluoroscopy is in the third/fourth portion of duodenum. (**b**) *Arrows* indicate gastroduodenal artery coil embolized using multiple coils. The vessel is occluded just beyond its origin from the proper hepatic artery

such as embolization, can be performed. Figure 2.5a, b shows embolization of the left gastric artery in a patient with a bleeding gastric ulcer.

In spite of the many benefits of arteriography in the detection of occult upper GI bleeding, there is the potential for complications. Arterial injury, contrast reactions, nephrotoxicity, thromboemboli, and hemorrhage are possible but occur quite infrequently. Arteriograms for upper or lower GI bleeding have a complication rate of <5 % [20]. Relative contraindications to catheter directed angiography include severe coagulopathy, congestive heart failure, recent myocardial infarction, renal insufficiency, and pregnancy.

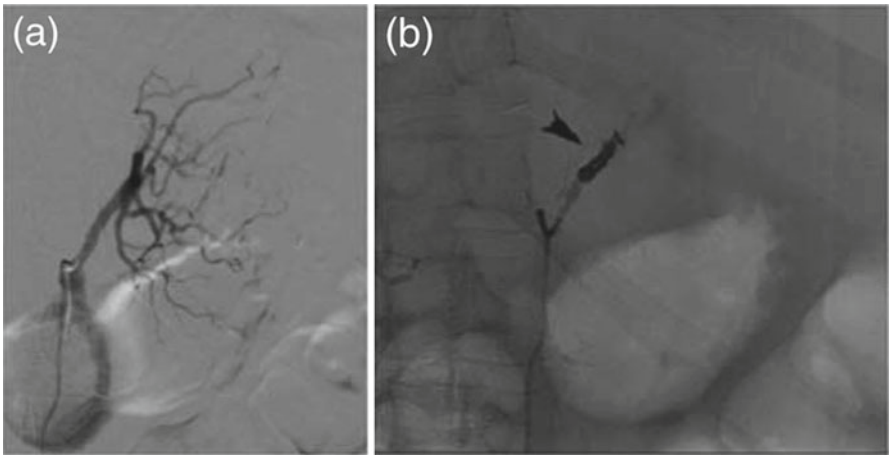

Fig. 2.5 (**a**) Arteriogram of a patient with bleeding from a gastric ulcer. Arteriogram depicts celiac injection with catheter in left gastric artery. (**b**) Left gastric artery occluded with multiple coils

Diagnostic Studies for Obscure Bleeds

Tagged Red Cell Scan

Technetium 99 m-labeled red blood cell scan, also known as tagged red cell scan, can also be used in patients with obscure UGIB. Red blood cells are labeled with technetium 99 and injected into the celiac artery in order to detect upper GI bleeding. This nuclear medicine scan allows for the detection of bleeds that are much slower, with a rate of 0.1–0.4 mL/min.

When compared to the red cell scan, angiography has less sensitivity for slow bleeding but is more precise at the localization of the bleeding site. The red cell scan allows for determination of active bleeding and many prefer to use it as a prelude to angiography [22]. If the red cell scan is positive suggesting current active bleeding, then angiography is more likely to be positive [20, 23]. When the red cell scan is used in conjunction with arteriogram, the sensitivity of the arteriogram increases to 61–72 % from 40 to 78 % [24]. When the red cell scan is negative, then putting the angiogram on hold may be the most effective strategy as it lowers the risk of complications from arteriogram in patients who are unlikely to be positive. Red cell scan has the benefit of allowing the patient to come back later if the bleed was not detected initially. The prolonged bioavailability of the radiolabeled red blood cells allows for continued imaging for up to 24 h [23]. This procedure is therefore well suited for instances when the bleeding is intermittent, which is a common occurrence. Nuclear scintigraphy is therefore recommended before arteriogram in patients with intermittent bleeding [23]. However, angiogram remains the diagnostic tool of choice in patients with obscure, continuous UGIB [20].

CT Angiography (CTA)

CT angiography is a widely available, minimally invasive diagnostic modality capable of quickly identifying active bleeding, its location, and its source when upper endoscopy has failed. At least one study has shown that CTA can detect the source of bleeding in 72 % of patients whose source could not be located via endoscopy [25].

This modality can detect extravasation at rates of 0.3–0.5 mL/min, better than conventional angiography [26]. Even in the absence of active bleeding, skilled radiologists can identify the culprit based on associated clot, angiodysplasia, abnormal mucosal enhancement, or masses; additionally, atypical sources such as hepatic and pancreatic pathology can be assessed. With modern multidetector systems, the sensitivity and specificity of CTA are 85–89 % and 85–92 %, respectively [27, 28].

Although the reported diagnostic yield of initial CT and conventional angiography are similar [29], CTA more readily lends itself to serial investigations to improve the yield; that said, 41 % of patients with a negative CTA for UGIB require further evaluation and treatment to stop bleeding [30]. Ultimately, another modality is required to intervene upon any bleeding source identified by CTA.

Other Modalities

Patients with upper GI bleeding may present with hematemesis, melena, hematochezia, iron deficiency anemia, or hypotension. Many of these signs/symptoms, however, are not exclusive to UGIB sources. The cause of melena, hematochezia, or iron deficiency anemia may be a bleeding source distal to the ligament of Treitz. If an upper GI source cannot be localized, then the rest of the small bowel as well as the large bowel may need examining via imaging studies. Options for further small bowel evaluation include endoscopic studies, such as capsule endoscopy or push enteroscopy, and radiologic imaging, such as small bowel follow-through. Capsule endoscopy is the favored method in most cases [31]. The aforementioned procedures will be discussed in detail in future lower GI bleeding chapters.

Summary

With the improvement of preventive therapy for peptic ulcer disease, there has been a decrease in the frequency of lesions that cause UGIB, but the mortality from UGIB has remained relatively unchanged [17]. UGIB is 60–90 % more common than are lower GI bleeds, and upwards of 75 % of apparently lower GI blood comes from an upper GI source. This leads to a 2–3 times higher mortality for UGIB than LGIB [22]. Patients with signs or symptoms of UGIB require a thorough evaluation

so that lesions at risk of ongoing or recurrent bleeding can be treated in a timely manner. Endoscopy is first line in the diagnosis of UGIB with an overall accuracy of around 80 % [4]. When the source cannot be detected via upper endoscopy, a tagged blood scan and/or conventional angiogram can be performed to find the source of bleeding. For suspected variceal bleeds, endoscopy is the first choice for diagnosis and treatment.

Acknowledgements Loretta Erhunmwunsee M.D. is credited with writing the core of this chapter in the first edition.

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