Clinical Gastroenterology and Hepatology 2014;12:246–252

Pathogenesis, Diagnosis, and Management of Gastric Ischemia

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BACKGROUND & AIMS: **Gastric ischemia is infrequently reported in the medical literature and under-recognized clinically and histopathologically. Various medical terms are used to describe gastric ischemia. We define and review the pathogenesis, diagnosis, and management of gastric ischemia.**

METHODS: **We describe 6 cases of gastric ischemia. We discuss features of the gastric vascular supply and review literature on this disorder.**

RESULTS: **Gastric ischemia results from diffuse or localized vascular insufficiency caused by etiologies such as systemic hypotension, vasculitis, or disseminated thromboembolism. The disorder is managed by fluid resuscitation, nasogastric tube placement (for intermittent air and fluid aspiration, to prevent or reduce gastric distention), aggressive acid reduction (via intravenous administration of proton pump inhibitors), and selective use of broad-spectrum antibiotics for patients with sepsis or gastric pneumatosis.**

CONCLUSIONS: **Gastric ischemia has a poor prognosis. Early diagnosis is required for appropriate patient management.**

Keywords: Endoscopy; Stomach; Ischemia; Gastric Ischemia; Gastrointestinal Bleeding; Ulceration.

Gastric ischemia is uncommon because of the rich collateral blood supply to the stomach.[1] It is infrequently reported in the medical literature and is likely under-recognized both clinically and histopathologically. There are several terms to describe gastric ischemia, including gastric infarction or apoplexy, gastric necrosis, moribund stomach, stress ulceration, chronic ischemic gastritis, and gastropathy.[2–24] We studied the gastric vascular supply, reviewed relevant medical literature, and present 6 cases of gastric ischemia. On the basis of our findings, we propose use of the term *gastric ischemia*. Clinical awareness of this syndrome will allow gastroenterologists and endoscopists to appropriately diagnose and manage affected patients.

Vascular Supply of the Stomach

Branches of the celiac artery provide the main vascular supply of the stomach (Figure 1). The celiac artery is the first major branch of the abdominal aorta, and it further branches into the left gastric artery, splenic artery, and the common hepatic artery. A small esophageal branch takes off of the left gastric artery close to the gastric cardia, and the main left gastric artery arches over the proximal lesser curvature. The splenic artery directs toward the splenic hilum. Several tenuous short gastric arteries leave the terminal branches of the splenic artery, and they supply parts of the gastric fundus. The splenic artery continues to loop around the greater curvature, becoming the left gastro-omental (gastroepiploic) artery. The common hepatic artery divides into proper hepatic artery and gastroduodenal artery. The small right gastric artery comes off the hepatic artery to supply the antrum and distal lesser curvature. The gastroduodenal artery becomes the right gastro-omental (gastroepiploic) artery and arches over the antrum and distal greater curvature. The arterial arch on the lesser curvature is formed by a large left gastric artery and a significantly smaller right gastric artery, whereas the greater curvature arterial arcade is formed equally by the right and left gastro-omental arteries. Anastomoses between the 2 arterial arches occur in the submucosa about two-thirds of the distance from the lesser to greater curvature (Supplementary Video 1). The gastric cardia is supplied by the left gastric artery, with extensive connections with short gastric arteries, the right gastric, and the left inferior phrenic arteries. On occasion, the first branch of the superior mesenteric artery,

Abbreviations used in this paper: CT, computed tomography; GI, gastrointestinal; NG, nasogastric; PPI, proton pump inhibitor.

1542-3565/$36.00
http://dx.doi.org/10.1016/j.cgh.2013.07.025

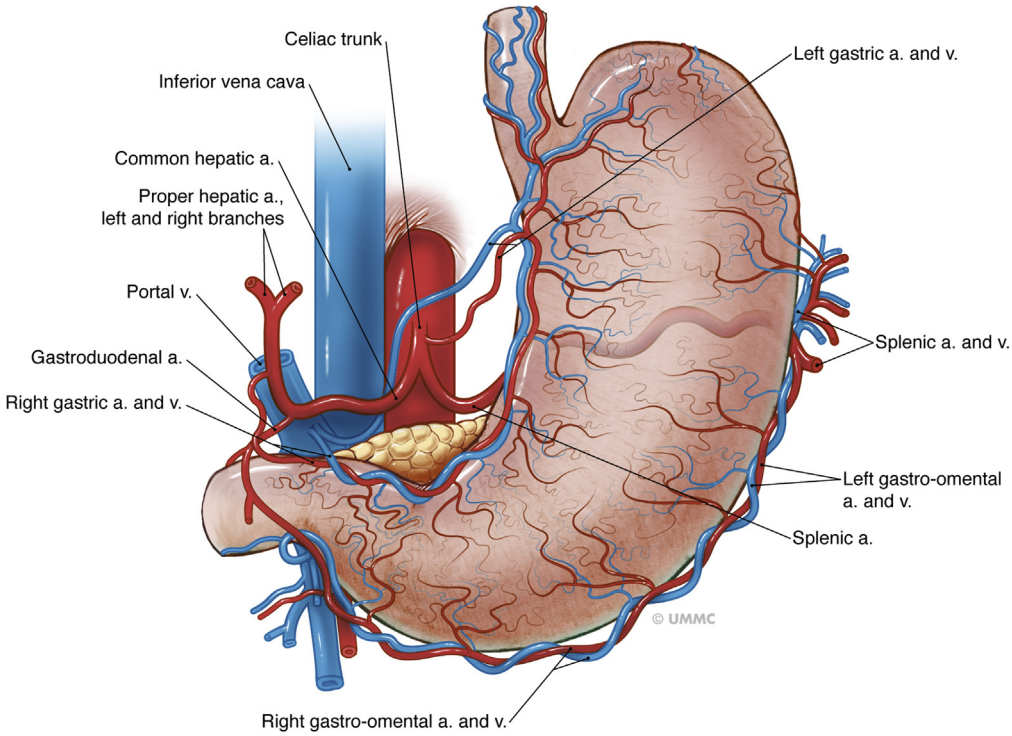

Figure 1. Vascular supply and network of the stomach. a., artery; v., vein.

inferior pancreaticoduodenal artery, provides collateral blood supply to the stomach. In addition, the collateral supply from esophageal arteries and the left inferior phrenic artery also contributes to the gastric vascular network. During endoscopy, the mucosal vascular network of the stomach sometimes can be highlighted in patients with gastric atrophy (Figure 2).

Cases

Case 1

A 46-year-old woman with opioid overdose, lactic acidosis, multiorgan failure, ischemic stroke, and upper gastrointestinal (GI) hemorrhage underwent upper GI endoscopy. On admission, she was transiently hypotensive and responded to aggressive fluid resuscitation. The patient was intubated without peritoneal signs. Before endoscopy, contrast-enhanced computed tomography (CT) scan of the abdomen was performed to rule out a potential septic source. CT scan revealed gastric pneumatosis and portal venous air (Supplementary Figure 1). Endoscopy was performed the second day after admission, and she was not hypotensive then. The endoscopic and histopathologic findings are listed in Table 1, Supplementary Video 2, and Figure 3. After diagnosis of necrotizing esophagitis and acute gastric ischemia, a surgical consultation was obtained, and the patient received broad-spectrum antibiotic coverage with meropenem, intermittent nasogastric (NG) tube aspiration, intravenous proton pump inhibitor (PPI) therapy, and parenteral nutrition. Repeat upper endoscopy was performed 1 week later to assess the mucosal healing and vascular supply and showed significant improvement in mucosal blood supply and ulcer healing (Supplementary Video 2). Repeat biopsy of the ulcer margin revealed histologic improvement with resolution of the microabscesses. The patient gradually recovered, and the length of hospital stay was 31 days. She was well at last follow-up (10 months after initial presentation).

Case 2

A 52-year-old hospitalized man with 1 week of severe watery diarrhea and acute epigastric pain underwent a contract-enhanced CT scan of the abdomen, which

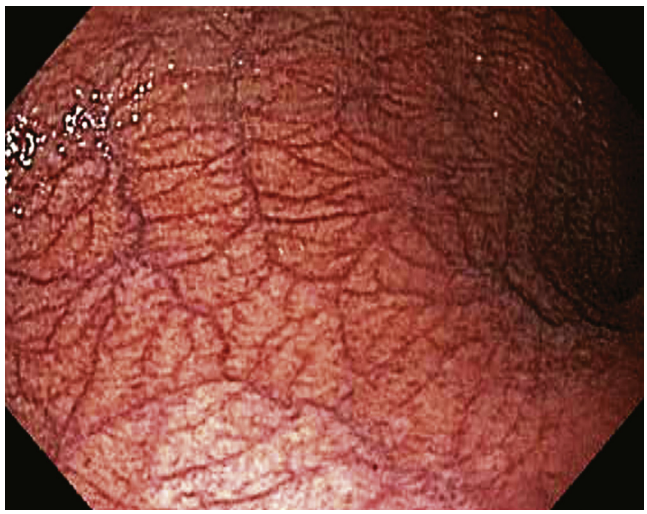

Figure 2. Endoscopic image of mucosal vascular network of the stomach in a patient with gastric atrophy.