Effectiveness of Coil Embolization in Angiographically Detectable versus Non-detectable Sources of Upper Gastrointestinal Hemorrhage

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PURPOSE: To determine whether the effectiveness of arterial embolization in patients with acute upper gastrointestinal hemorrhage is related to the visualization of contrast medium extravasation at angiography.

MATERIALS AND METHODS: Transcatheter embolization was performed in 108 patients who experienced acute upper gastrointestinal hemorrhage during a 5-year period. Patient charts were retrospectively reviewed. Thirty-six patients who underwent embolization after angiography demonstrated active contrast medium extravasation from an involved artery. Seventy-two patients underwent embolization in the absence of contrast medium extravasation into a bowel lumen. Embolization technique, requirement for further blood products, need for further surgery, and 30-day mortality were recorded.

RESULTS: The gastroduodenal artery (GDA) was embolized in 26 of the 36 patients (72%) with extravasation, and the left gastric artery was embolized in 10 (28%). The GDA was embolized in 64 of the 72 patients (89%) without extravasation, and the left gastric artery was embolized in 13 (18%). After embolization, 23 of the 36 patients (64%) with extravasation and 44 of the 72 (61%) without extravasation required additional blood product transfusions. Seven of the 36 patients (19%) with extravasation and 16 of the 72 (22%) without extravasation required subsequent surgery secondary to bleeding. Thirty-day hemorrhage-related mortality was 17% (six of 36 patients) in the positive extravasation group and 22% (16 of 72 patients) in the negative extravasation group. The treatment success rate was 44% (16 of 36 patients) in the positive extravasation group and 44% (32 of 72 patients) in the negative extravasation group.

CONCLUSIONS: In patients with acute upper gastrointestinal hemorrhage, arterial embolization is equally effective in patients who demonstrate active contrast medium extravasation at angiography as in those who do not show contrast extravasation.

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Abbreviation: GDA = gastroduodenal artery

UPPER gastrointestinal hemorrhage is a life-threatening condition that requires immediate management. Approximately 30–100 per 100,000 are hospitalized annually for nonvariceal upper gastrointestinal hemorrhage (1). The average mortality for upper gastrointestinal hemorrhage is 10%, and mortality increases to 35% in patients with multiple co-morbidities (2). Morbidity and mortality are also dependent on the cause of hemorrhage (2). Although peptic ulcer is the most common cause of nonvariceal upper gastrointestinal hemorrhage (30%–50%), other causes include Mallory-Weiss tear, erosive gastritis/duodenitis, esophagitis, malignancy, and vascular malformations (2).

The first line of treatment includes a combination of medical therapy and endoscopy (1). Medical therapy includes aggressive volume restoration by means of blood products or saline and acid-reducing agents such as omeprazole. Primary evaluation with endoscopy allows for direct visualization of the mu-

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cosa to identify the presence, location, and cause of the hemorrhage (3). Vasoconstriction via epinephrine injection and thermal coagulation are available options in the endoscopic treatment of bleeding, and in selected cases hemostatic clips can be applied (3).

In patients who demonstrate active arterial bleeding at endoscopy, repeat bleeding can occur in up to 30% of endoscopically treated sites (3,4). Occasionally, bleeding may be so brisk as to obscure the endoscopic visual field, precluding localization and treatment. In these settings, angiography can be instrumental in localizing the site of hemorrhage and can be used for therapeutic transcatheter embolization. Contrast medium extravasation from a bleeding artery is frequently not identified at angiography (4). In these situations, the likely offending artery may be embolized in the hopes of preventing further hemorrhage.

The purpose of our study was to determine whether the effectiveness of arterial embolization in patients with acute upper gastrointestinal hemorrhage is related to the visualization of contrast medium extravasation at angiography.

MATERIALS AND METHODS

Patient Group

This was a retrospective study. Inclusion criteria for the study included all patients who underwent visceral artery embolization secondary to upper gastrointestinal hemorrhage. We searched our institutional radiology information system database for all interventional radiology examinations that included visceral artery embolization from September 1, 2001, through December 31, 2006. These patients were then tabulated in a Health Insurance Portability and Accountability Act–compliant research database approved by our institutional review board (the need for written informed consent was waived). Our initial search yielded 211 procedures. We then refined the search by reviewing the patients' charts to determine which procedures included visceral angiography in patients with upper gastrointestinal hemorrhage, defined as bleeding from an enteric source proximal to the ligament of Treitz. The site of hemorrhage was determined either with endoscopy or on the basis of clinical presentation (eg, hematemesis). During the study period, visceral artery embolizations were performed in 108 patients with acute upper gastrointestinal hemorrhage; these cases formed the basis of our study. The remaining 103 procedures (not part of the study) included embolization secondary to lower gastrointestinal bleed, elective preoperative embolization before organ resection, or embolization due to extraenteric intraabdominal hemorrhage. None of the patients who underwent visceral artery embolization for upper gastrointestinal hemorrhage were excluded from the study.

Table 1
Summary of Patient Demographics

Characteristic	Negative Extravasation (n = 72)	Positive Extravasation (n = 36)
Sex (M/F)	41 (57)/31 (43)	25 (69)/11 (31)
Mean age ± standard deviation (y)	65.4 ± 14.8	66.4 ± 14.8
Recent surgery	29 (40)	12 (33)
Cardiac disease	36 (50)	13 (36)
Respiratory compromise	32 (44)	6 (17)*
Renal insufficiency	24 (33)	11 (31)
Sepsis	16 (22)	7 (19)
Pancreatitis	5 (6.9)	3 (8.3)

Note.—Except where indicated, data are given as numbers of patients. Numbers in parentheses are percentages.
* P = .004.

Table 2
Endoscopic Findings before Embolization

Characteristic	Negative Extravasation (n = 72)	Positive Extravasation (n = 36)
≥1 endoscopic procedure	70 (97)	31 (86)*
≥1 endoscopic procedure	32 (44)	7 (19)†
Bleeding ulcer	24 (33)	10 (28)
Clean nonbleeding ulcer	15 (21)	7 (19)
Fresh blood	17 (24)	4 (11)
Old blood	4 (5.6)	3 (8.3)
Dieulafoy lesion	3 (4.2)	2 (5.6)
Mass	3 (4.2)	2 (5.6)
Varices	1 (1.4)	0 (0)
Indeterminate	5 (6.9)	3 (8.3)

Note.—Data are given as numbers of patients. Numbers in parentheses are percentages.
* P = .040.
† P = .013.

Patient characteristics are summarized in Table 1. All patients were hospitalized secondary to upper gastrointestinal hemorrhage or experienced upper gastrointestinal hemorrhage at some point during their hospitalization. Numerous patients had multiple co-morbidities, such as cardiac compromise, respiratory failure, renal compromise, sepsis, and pancreatitis. There were a significantly greater number of patients with respiratory compromise in the group that was negative for extravasation; there were no other significant differences between the two groups (Table 1). The average patient age was similar for both groups. Twelve of the 36 patients (33%) with extravasation and 29 of the 72 patients (40%) without extravasation had recently undergone surgery. Surgeries included small bowel resection and/or lysis of adhesions (n = 15), repair of perforated ulcer (n = 8), elective and ruptured abdominal aortic aneurysm repair (n = 7), coronary artery bypass graft and/or cardiac valve replacements (n = 5), nephrectomy (n = 3), thyroidectomy (n = 1), ampullary adenoma resection (n = 1), liver transplantation (n = 1), limb resection (n = 1), aortic dissection repair (n = 1), and aortafemoral bypass (n = 1).