

Active gastrointestinal diverticulum bleeding diagnosed by computed tomography angiography

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Author contributions: Xu XQ and Liu W designed the report; Xu XQ, Hong T, Li BL and Liu W were the attending doctors for these patients; Xu XQ, Hong T and Li BL performed the surgical operations; Xu XQ and Liu W organized the report; Xu XQ wrote paper.

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Received: April 14, 2014 Revised: May 29, 2014

Accepted: June 25, 2014

Published online: October 7, 2014

Abstract

A diverticulum is a bulging sack in any portion of the gastrointestinal tract. Small intestine diverticular disease is much less common than colonic diverticular disease. The most common symptoms include non-specific epigastric pain and a bloating sensation. Major complications include diverticulitis, gastrointestinal bleeding, acute perforation, intestinal obstruction, intestinal perforation, localized abscess, malabsorption, anemia, volvulus and bacterial overgrowth. We report one case of massive jejunal diverticula bleeding and one case of massive colonic diverticula bleeding, both diagnosed by acute abdominal computed tomography angiography and treated successfully by surgery.

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Key words: Diverticulum; Gastrointestinal diverticular bleeding; Angiography; Computed tomography angiography; Endoscopy

Core tip: Gastrointestinal diverticular disease is common and asymptomatic in most cases; however, massive gastrointestinal bleeding caused by diverticular disease is rare. This article describes the diagnosis and management of these diseases through acute abdominal computed tomography angiography.

Xu XQ, Hong T, Li BL, Liu W. Active gastrointestinal diverticulum bleeding diagnosed by computed tomography angiography. *World J Gastroenterol* 2014; 20(37): 13620-13624 Available from: URL: <http://www.wjgnet.com/1007-9327/full/v20/i37/13620.htm> DOI: <http://dx.doi.org/10.3748/wjg.v20.i37.13620>

INTRODUCTION

A diverticulum is a bulging sack in any part of the gastrointestinal tract. The large intestine is the most common site for the formation of diverticula. The diverticulum forms a pouch in a weakness of the intestine, which generally corresponds to the site where an artery enters into the muscle layer. It is thought that spasms increase pressure in the intestine, creating more diverticula and enlarging existing ones. Diverticula are classified as real or false: real diverticula are composed of all of the intestine's layers, while false diverticula consist of the uncus of the mucosa and the submucosa^[1].

Diverticular disease is actually uncommon in people under the age of 40. By the age of 50, about 1/3 of the population has diverticulosis; the prevalence increases to 60% in people over 80 years of age^[2].

Colonic diverticular disease is much more common than small intestine diverticular disease. It is believed that diverticula develop as a result of abnormalities in intestinal peristalsis, intestinal dyskinesia and very high intraluminal pressure, such as in the colon^[3].

Most gastrointestinal diverticula are asymptomatic;

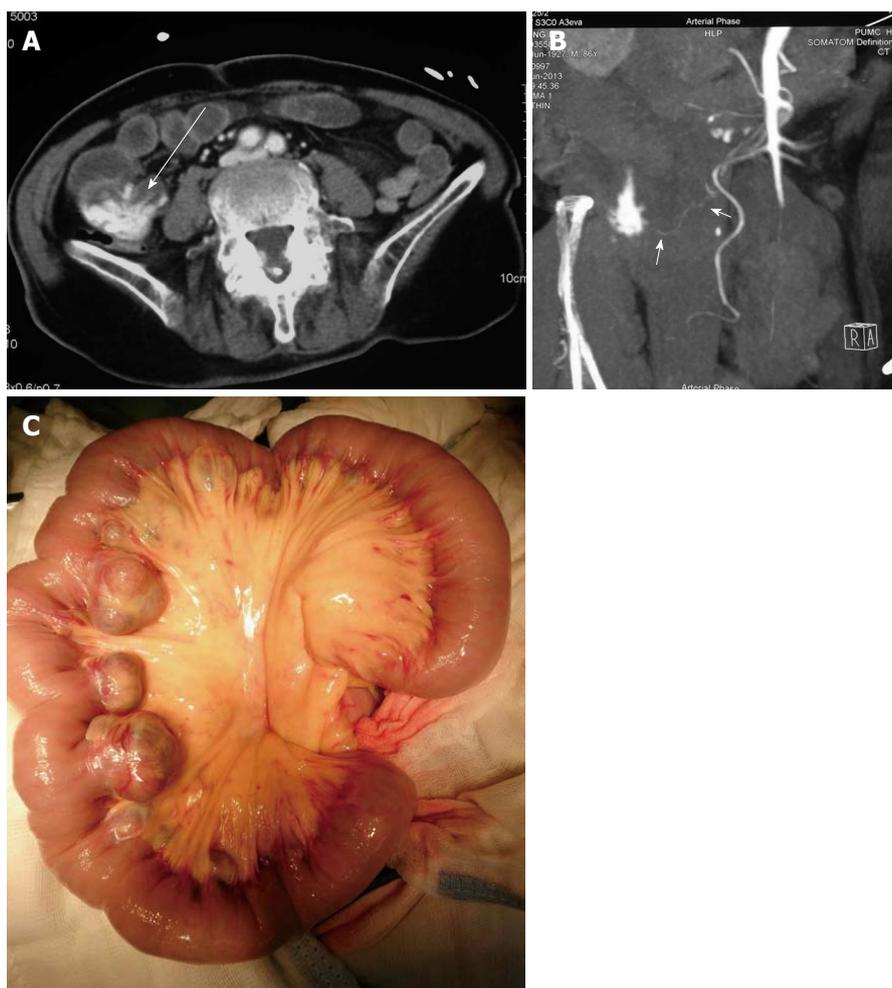


Figure 1 Imaging of case 1. A: Computed tomography (CT) angiography revealed contrast extravasation in a jejunal diverticulum (arrow); B: CT angiography showed the blood supply for the jejunal diverticulum source was from a branch of the superior mesenteric artery (arrow); C: Multiple diverticula in a 30 cm segment of the jejunum.

however, they are usually complicated by diverticulitis with or without bowel perforation, intestinal obstruction and bleeding once they become symptomatic. Massive upper gastrointestinal bleeding secondary to gastrointestinal diverticulosis is extremely rare. Most of them present with obscure gastrointestinal bleeding^[4-6]. However, colonic diverticular bleeding is a common cause of hematochezia. It accounts for approximately 40% of the episodes of massive lower gastrointestinal bleeding and often results in hospitalization. Severe hemorrhage can occur in 3%-5% of patients with diverticula^[7]. Diverticula are predominantly observed in the left colon in Western countries, while right-sided diverticula are more commonly found in Asian countries^[8].

Computed tomography (CT) angiography, colonoscopy and angiography are essential for the diagnosis and treatment of gastrointestinal diverticular bleeding^[1-8]. However, a precise location and definite hemostasis are often difficult because diverticula are usually numerous and bleeding is intermittent^[6-8]. Blind segmental resection in the cases of undiagnosed bleeding site is responsible for the high re-bleeding rate of 42% and mortality of 57%^[9]. Therefore, precise localization is essential for the

treatment in patients with a life-threatening diverticular bleeding. We herein describe two patients with massive jejunal and colonic diverticular bleeding, respectively, whose bleeding sites were located precisely and successfully by CT angiography and then treated by surgery.

CASE REPORT

Case 1

An 86-year-old male presented to the emergency department with recurrent massive hematochezia. His past medical history was significant for hypertension for 20 years without any history of gastrointestinal bleeding. On physical examination, the abdomen was soft without tenderness. His hemodynamic status was unstable, with a hemoglobin of 6.5 g/dL. An acute abdominal CT angiography revealed contrast extravasation in a jejunal diverticulum (Figure 1A, arrow). The superior mesenteric artery was reconstructed, which indicated the blood supply for the jejunal diverticulum source was from a branch of the superior mesenteric artery (Figure 1B, arrow). Once the diagnosis of jejunal diverticular bleeding was made, a laparotomy was performed. Multiple diverticula

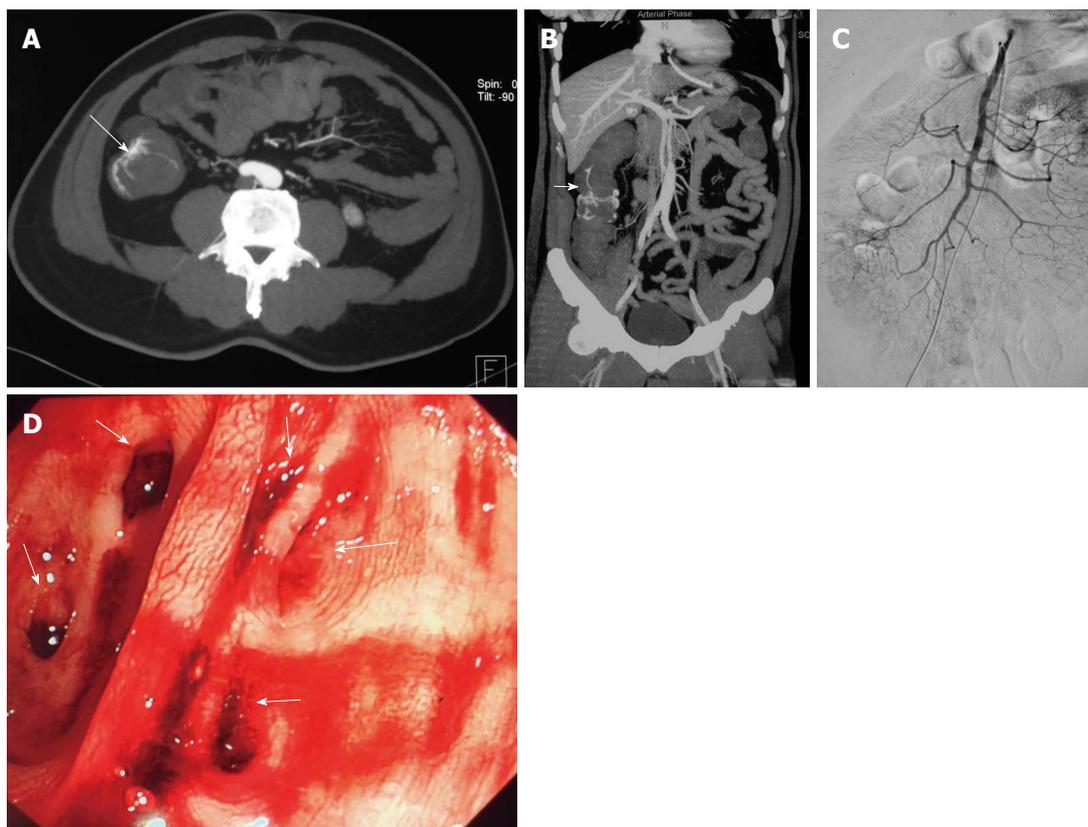


Figure 2 Imaging of case 2. A: Abdominal computed tomography (CT) revealed contrast extravasation in the ascending colon (arrow); B: CT angiography revealed bleeding from the intramural branches of the marginal artery supplying the ascending colon (arrow); C: Angiography failed to reveal the precise location of the bleeding; D: Emergent colonoscopy revealed multiple diverticula in the middle part of the ascending colon without definite bleeding vessels identified (arrow).

in a 30 cm segment of jejunum were found, beginning 50 cm distal to the Treitz's ligament (Figure 1C). The involved segment was resected. The patient had no further postoperative episodes of gastrointestinal bleeding.

Case 2

A 56-year-old male presented to the emergency with recurrent massive hematochezia. His past medical history was non-significant, with no history of gastrointestinal bleeding. On physical examination, the abdomen was soft without tenderness. His hemodynamic status was unstable (BP 85/50 mmHg, HR 110/min) with a hemoglobin of 5.4 g/dL. The acute abdominal CT angiography revealed contrast extravasation in the ascending colon (Figure 2A, arrow) and bleeding from the intramural branches of the marginal artery supplying the ascending colon (Figure 2B). Angiography failed to reveal the precise location of the bleeding (Figure 2C). Emergent colonoscopy was performed, which revealed multiple diverticula in the middle part of ascending colon (Figure 2D, arrows), but no definite bleeding vessels were identified. When the conservative treatment for colonic diverticular hemorrhage was unsuccessful after three episodes of hemorrhage, a laparotomy was performed. Partial colectomy for most of the ascending colon was then performed. The patient had no further post-operative episodes of gastrointestinal bleeding.

DISCUSSION

Gastrointestinal diverticular disease is asymptomatic in up to 70% of cases and patients may suffer from acute complications such as bleeding, perforation, diverticulitis or intestinal obstruction^[4-6]. Bleeding is uncommon and constitutes only 5%-33% of all cases^[10]. Both upper and lower gastrointestinal diverticular usually involve elderly patients^[2]. A significant number of patients also present with life-threatening bleeding. Based on these facts, clinicians should keep in mind with this uncommon but dangerous situation while managing elderly patients with massive gastrointestinal bleeding.

Preoperative diagnosis of gastrointestinal diverticular bleeding is sometimes difficult^[11,12]. Many modalities have been introduced to evaluate gastrointestinal diverticular bleeding, including barium contrast study, Technetium ^{99m} (^{99m}Tc) RBC scan, CT scan, angiography, CT angiography, capsule endoscopy, *etc.*

The upper gastrointestinal diverticular bleeding is much less common than the lower gastrointestinal diverticular bleeding (colonic diverticular disease). The duodenum is the second most common location for gastrointestinal tract diverticula after the colon. Other less common locations include the third and fourth portions of the duodenum and the jejunum^[13].

Colonic diverticula are the most common source of

life-threatening lower gastrointestinal bleeding. Most diverticula are located in the descending or sigmoid colon; however, spontaneous bleeding is common in diverticula of the ascending colon^[14].

Emergent endoscopy is the standard diagnostic and therapeutic technique for gastrointestinal bleeding, but it can be difficult when the typical gastrointestinal bleeding involves fast and massive bleeding into an unprepared bowel. As a matter of fact, no exact explanation is found in up to 20% in such cases of gastrointestinal bleeding. Arteriography is reserved for patients for whom endoscopy is unfeasible or inconclusive, and for whom bleeding persists after localization; however, it risks ischemic damage to the bowel wall and failure to detect all bleeding sources. CT angiography can be useful in locating the obscure source of bleeding. CT angiography showed pooled sensitivity of 86% and specificity of 95%, respectively in the diagnosis of acute gastrointestinal bleeding^[15]. When massive gastrointestinal bleeding occurs in patients with unstable hemodynamic status, CT angiography is essential, it could show sac-like collections of extravasation, so that details of its arterial supply can be clearly ascertained in order to optimize treatment decisions^[16].

CT angiography is accurate in the diagnosis of acute gastrointestinal bleeding and can show the precise location and etiology of bleeding. Thus, CT angiography could be used for the first line diagnostic method for most of the patients with active gastrointestinal bleeding without relative absolute contraindications^[15].

The management of gastrointestinal diverticular bleeding is mainly by surgical intervention, although there are some reports of spontaneous recovery. The mortality rate has dropped in recent years. The decrease in mortality may be attributed to the advance of diagnostic modalities that allow clinicians to stratify patients for endoscopic therapy, conservative treatment, or surgery^[17]. For those with less severe bleeding, endoscopic diagnosis and treatment are good options^[18]. A significant number of patients are expected to bleed again during the follow-up period, although such a non-surgical approach does control the bleeding. For those presented with massive bleeding, emergency surgery still remains one of the options to control the bleeding. Whether these patients should receive surgery after initial medical management remains unclear. This approach may be suggested only when they suffer from recurrent bleeding. Surgery is indicated in patients with ongoing recurrent bleeding when therapeutic endoscopy or angiography is not available or feasible. Patients with recurrent gastrointestinal bleeding should certainly be treated with surgery because the risk of further episodes may increase with time^[19]. Approximately 10%-25% of patients require emergency surgery for hemodynamic instability^[20].

In conclusion, CT angiography is a noninvasive, rapid, reproducible and widely available technique that can be performed successfully upon the majority of patients presenting with an acute episode of gastrointestinal diverticular bleeding. Positive contrast-enhanced multidetec-

tor CT can define the bleeding sites with high accuracy. Occasionally, this technique can even define the cause of active gastrointestinal bleeding, which, if combined with anatomical information, can effectively inform subsequent angiography or surgery. Multiphasic imaging enables direct visualization of active bleeding into the bowel. CT angiography could serve as a first diagnostic modality in the evaluation of patients with substantial bleeding^[21].

COMMENTS

Case characteristics

Active gastrointestinal diverticulum bleeding diagnosed by computed tomography (CT) angiography.

Differential diagnosis

It should be considered in the differential diagnosis of patients with gastrointestinal bleeding caused by any other reasons.

Diagnostic imaging

Diagnostic imaging mainly by CT angiography.

Treatment

Angiography or surgery may be performed when definite bleeding sites are identified by CT angiography.

Peer review

This is a well written and well-documented report of two cases of active gastrointestinal diverticular bleeding.

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P- Reviewer: Manguso F, Miller LE, Singhal S **S- Editor:** Nan J
L- Editor: Stewart G **E- Editor:** Liu XM





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ISSN 1007-9327

