CASE REPORT

Primary Aortoduodenal Fistula Caused by Tuberculous Aortitis Presenting as Recurrent Massive Gastrointestinal Bleeding

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Upper gastrointestinal bleeding from primary aortoduodenal fistula (PADF) is unusual and fatal. The etiology of PADF from tuberculous aortitis is rare. We report a 69-year-old male patient who suffered recurrent hematemesis and hematochezia with hypovolemic shock of unknown origin. Initial endoscopy failed to lead to a diagnosis. A bleeder over the third portion of the duodenum was found after the third endoscopy. Exploratory laparotomy showed a ruptured aortic pseudoaneurysm with an aortoduodenal fistula. Dacron graft repair of the aorta and simple closure of the duodenal fistula were carried out. Pathologic examination revealed tuberculous aortitis. The patient survived and was symptom-free following operation and antituberculous therapy. Review of the literature revealed that the clinical presentations in this disorder are insidious. The endoscopic findings are atypical. We conclude that so-called "herald bleeding", a history of tuberculous infection or aortic aneurysm and a high degree of suspicion are critical for successful diagnosis. Early diagnosis and surgical exploration are needed for timely and successful management. [*J Formos Med Assoc* 2008;107(1):77–83]

Key Words: aortitis, aortoduodenal fistula, gastrointestinal bleeding, tuberculosis

Aortoenteric fistula (AEF) is a direct communication between the aorta and intestinal lumen. There are primary and secondary forms. Primary AEF is usually due to erosion of an abdominal aortic aneurysm into the intestine. Secondary AEF is caused by reconstructive procedures on the abdominal aorta. Primary AEF is a severe life-threatening disease because of the difficulty of diagnosis and fatal exsanguinating hemorrhage. The incidence of primary AEF in the general population is about 0.07%. In patients with abdominal aortic aneurysm, the incidence may increase to 0.69–2.36%.[1] The predominant sites of primary AEF are in the third and fourth portions of the duodenum. About 54–78.5% of primary AEF comes from aortoduodenal fistula.[2,3] The predominant causes of primary AEF is aortic aneurysm or atherosclerosis, and about 70% of primary aortoduodenal fistula (PADF) is related to the same etiology.[4] Septic aortitis-induced PADF is unusual.[4–7] In addition, tuberculous aortitis (TBA)-related PADF is rare.[8–11] Early diagnosis of this disease is difficult but crucial. The typical presentation of the clinical triad of fistula (gastrointestinal hemorrhage, abdominal pain, pulsating abdominal mass) is noted in only 11–25% of patients with PADF.[2,12,13] In this report, we describe a case of PADF with the presentation of

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recurrent massive upper gastrointestinal bleeding with hypovolemic shock. The clinical presentation was insidious and the endoscopic findings were atypical. The final diagnosis relied on surgical laparotomy and pathologic study even though endoscopy had found the bleeder.

Case Report

A 69-year-old male patient had a history of colon cancer, for which he had undergone radical resection 2 years previously, and pulmonary tuberculosis (TB), for which he had received a complete 6-month course of anti-TB treatment. The anti-TB regimen had consisted of a combination of four drugs (rifampin, isoniazid, pyrazinamide, ethambutol) for 2 months, and a combination of three drugs (without pyrazinamide) for an additional 4 months. After 6 months, anti-TB treatment was stopped and he has been disease-free for about 1 year already. He received regular follow-up in a local hospital for the colon cancer and pulmonary TB; no evidence of cancer recurrence was noted. History of other systemic diseases, major operations or smoking, alcohol and drug abuse were denied. However, he had been suffering from early satiety and frequent acid reflux in the recent 2 years.

He experienced episodes of bloody vomitus and tarry bloody stool passage about 2 weeks before he was transferred to our hospital. Initially, he was admitted to a local hospital. The first endoscopy led to suspicion of angiodysplasia or Dieulafoy's lesion of the gastric fundus. Heating probe coagulation was performed but failed to prevent re-bleeding. Repeated massive upper gastrointestinal bleeding associated with hypovolemic shock occurred thrice during hospitalization in the local hospital. An additional two courses of thermal coagulation by endoscopic heater probe were performed to treat the suspicious bleeder at the gastric fundus. Gradually, the active bleeding seemed to subside but tarry stool passage persisted. He was discharged from the local hospital and referred to our clinic for further evaluation. Physical examination findings were not unusual. Upper gastrointestinal endoscopy was repeated immediately and showed grade A reflux esophagitis (by Los Angeles classification) and some erosive patches over the gastric fundus. No active bleeder could be found. He received proton pump inhibitor at home.

Unfortunately, 2 days later, he was sent to our emergency room as a result of a fainting spell which led to a fall that resulted in lacerations of the frontal skin. Tarry stool passage and anemia were noted at the same time. Initial blood pressure was 120/80 mmHg, pulse rate was 96/min and body temperature was 36.5°C. The hemoglobin level was 11.3 g/dL and hematocrit was 33%. No thrombocytopenia, coagulopathy or abnormal liver function could be found. Sudden onset of bloody vomitus followed by hypovolemic shock and collapse (blood pressure dropped to 83/66 mmHg, pulse rate dropped to 51/min) developed 4 hours after wound treatment. Emergency resuscitation was performed, including adequate fluid challenge, blood transfusion (2 units of whole blood and 4 units of packed red blood cells), intubation of endotracheal tube and ventilator support. Hemoglobin level dropped to 8.8 g/dL.

Re-examination revealed a mild distended abdomen at the periumbilical area without tenderness or muscle guarding. Bowel sounds were hypoactive. Digital rectal examination showed bloody stool passage. No palpable mass, shifting dullness, increased splenic dullness or engorgement of superficial vein could be found. Chest X-ray showed old interstitial fibrosis over bilateral upper lung fields (Figure 1). Upper gastrointestinal endoscopy was repeated and showed clear gastric content without any active bleeders. Colonoscopy was not performed due to the patient's relatively unstable condition.

Unfortunately, nasogastric drainage showed fresh blood again 4 hours after admission. A third endoscopy disclosed a slowly oozing bleeder over the third portion of the duodenum with blood clot adhesion (Figure 2). Diverticular bleeding was suspected initially. Two hemoclips were applied,

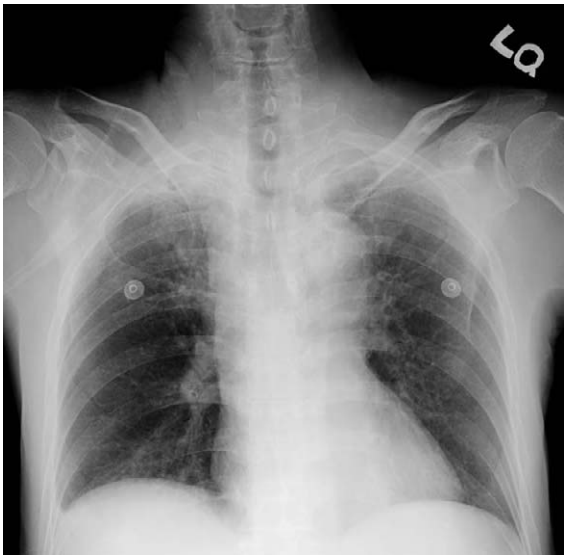

Figure 1. Chest X-ray shows chronic interstitial fibrosis and pleural thickening of bilateral upper lung fields comparable with old pulmonary tuberculosis.

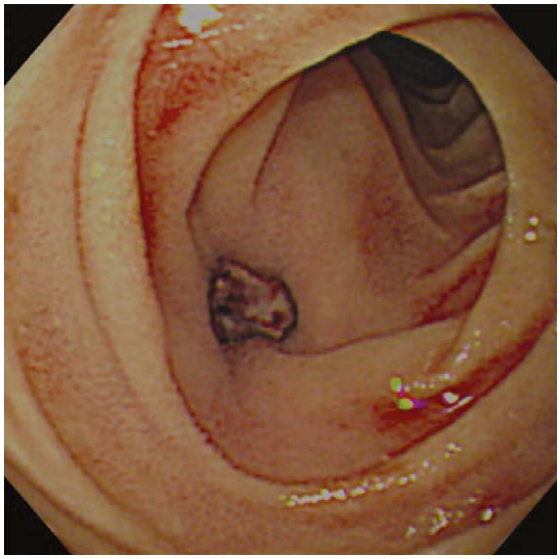

Figure 2. Upper gastrointestinal endoscopy shows a vessel-like bleeder with blood clot adhesion over the third portion of the duodenum.

followed by local injection with diluted epinephrine 9 mL to stop the bleeding. Abdominal computed tomography was delayed due to the patient's relatively unstable condition. He received adequate blood transfusion and fluid resuscitation. Nasogastric tube and blood pressure monitoring were performed to detect signs of re-bleeding and an operation was planned if re-bleeding occurred. Massive re-bleeding developed again 6 hours later and he received emergency exploratory laparotomy to check the bleeder.

Hemoperitoneum was found on exploration. Severe adhesion between the third portion of the duodenum and the wall of the abdominal aorta was noted initially. However, massive bleeding developed when the surgeon examined the duodenal third portion and separated the adhesion. The bleeder was compressed by the surgeon's hand first, which was followed by emergency blood and fluid resuscitation on table. Then, the cardiovascular surgeon took over to stop the bleeding and stabilized the patient. A ruptured aortic pseudoaneurysm measuring about 3 cm with a fistula to the third portion of the duodenum was found. Some granulomatous tissue adherent around the fistula and the aortic wall was also noted. There was no enlarged lymph node or severe adhesion of the other organs in the upper abdomen. Repair of the aorta with Dacron graft and simple closure of the duodenal fistula were performed. Pathologic examination revealed granuloma of the aorta wall (Figure 3) and positive acid-fast bacilli stain (Figure 4). TBA with PADF was diagnosed. The patient survived and has remained symptom-free now for 2 years following the operation and anti-TB medication.

Discussion

PADF is a rare cause of upper gastrointestinal bleeding but is associated with a high rate of mortality if undiagnosed or untreated. The etiology of PADF is mainly aortic aneurysm or atherosclerosis.[4] Septic aortitis-related PADF is uncommon because only 4.7% of abdominal aortic aneurysms are from inflammatory aneurysms.[9] The mortality rate of emergent operation from rupture is as high as 70%.[9] Other less common causes of PADF are duodenal TB, radiotherapy, local tumor invasion and post-operation.[14–17] The mortality rate is high if there is no early diagnosis and management.

TBA is also rare and life-threatening. The incidence of TBA in septic aortitis is unclear. According

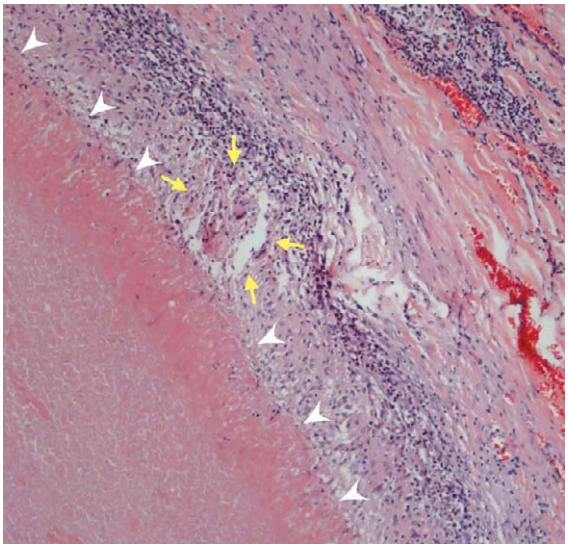

Figure 3. Pathologic examination of the aorta wall shows granuloma formation with Langerhans giant cell (arrows) and caseous necrosis (arrowheads).

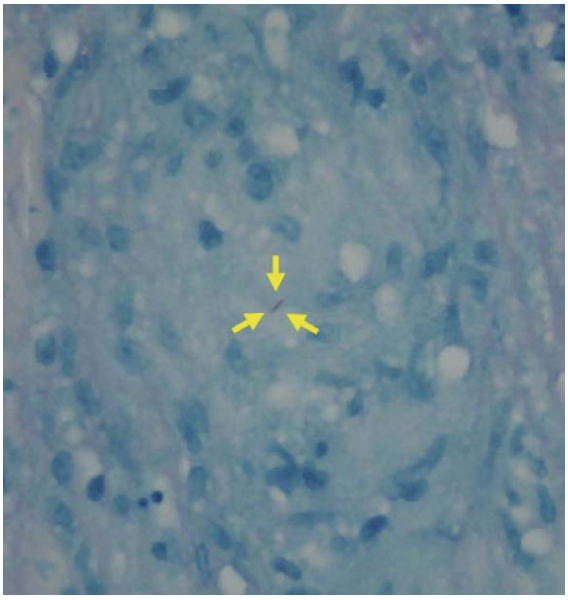

Figure 4. Acid-fast stain of the aortic granulation tissue is positive for acid-fast bacilli (arrows).

to Tsai et al's report,[11] only 51 cases of tuberculous mycotic aneurysm were reported up to 2004. In their review, about 50% of the tuberculous mycotic aneurysms were located in the abdominal aorta, including 80% in the infrarenal aorta and 25% in the suprarenal aorta. The most common presentations were gastrointestinal bleeding, fever and back pain. The total mortality rate was as high as 42%. One hundred percent mortality was also noted in patients who only received medical treatment.[11]

According to Long et al's report,[18] tubercle bacilli may reach the aorta wall in one of three ways: (1) direct implantation on the internal surface of the vessel wall, especially when the lining has been altered by atherosclerotic plaque or ulcers; (2) implantation to the adventitia or media from the vasa vasorum; (3) direct extension from a contiguous focus such as a lymph node or paraspinal abscess. The last one is the predominant mechanism. However, in our patient, the causative mechanism appeared to be direct implantation of tubercle bacilli to the atherosclerotic plaque of the vessel wall as pathologic study showed atherosclerotic change and granuloma of the aorta without aneurysm formation. The operative findings revealed no focal lymphadenopathy or abscess. The granuloma formation of the aorta is suspected to have led to the chronic endarteritis and induced inflammatory pseudoaneurysm as seen intraoperatively. Focal adhesion and erosion to the duodenal lumen developed gradually, with fistula formation that induced upper gastrointestinal bleeding.

We reviewed the English-language literature from 1986 to 2006, and found only five cases (including this case) of TBA with PADF (Table).[8–11] All were male, with ages ranging from 38 to 80 years. The clinical manifestation was upper gastrointestinal bleeding in all cases. Two cases presented with massive upper gastrointestinal bleeding and received emergent surgical intervention. The other three (60%), including our patient, had recurrent upper gastrointestinal bleeding as so-called *herald bleeding*—rapid and large volume gastrointestinal bleeding followed by a period of grace and a period of exsanguinating hemorrhage with cardiovascular collapse. As mentioned earlier, only 11–25% of PADF present with the typical triad of fistula;[2,12,13] none of the five cases of TBA with PADF presented with the typical triad. However, *herald bleeding* occurred in about 75% of patients with AEF.[13] A similar incidence (60%) was noted in our review of TBA

Table. Cases of tuberculous aortitis with primary aortoduodenal fistula found in the literature

	Tsai et al[11]	de Kruijf et al[8]	Allins et al[9]	Goldbaum et al[10]	Present case
Age (yr)/Sex	80/M	38/M	77/M	75/M	69/M
GI bleeding	Recurrent	Recurrent	Massive	Massive	Recurrent
Concurrent TB	Pulmonary TB	Cervical lymphadenopathy	None	None	Pulmonary TB
Endoscopy	Not identified	Not identified	Not done	Not done	Bleeder identified
Aneurysm	Present	Present	Present	Absent	Absent
Diagnosis	Exploratory laparotomy	Exploratory laparotomy	Exploratory laparotomy	Exploratory laparotomy	Exploratory laparotomy
Treatment	Dacron graft	Aneurysmectomy	Axillobifemoral bypass	Resection & *in situ* repair	Dacron graft
Outcome	Death	Survival	Death	Survival	Survival

GI = gastrointestinal; TB = tuberculosis.

with PADF (Table). It is truly an important sign of this disease.

In addition, this disorder should be considered in patients with massive or repetitive upper gastrointestinal bleeding and a history of abdominal aortic aneurysm, or palpable pulsating abdominal mass, because of the high incidence of aortic aneurysm in PADF.[4] On the other hand, about 67–75% of tuberculous mycotic aneurysm had concurrent TB infection at another site.[11,18] In our review, three of the five cases (60%) had mycotic aneurysms and two were diagnosed before bleeding (one from CT and the other from magnetic resonance imaging). Three of the five (60%) had another focus of TB infection (two in the lung and one in cervical lymph nodes), including our patient (Table). Determining if a patient has a history of aortic aneurysm or tuberculous infection is really important to give us more information for clinical diagnosis. Indeed, tubercle bacilli can induce inflammatory pseudoaneurysm or directly erode through the aorta into the duodenum without formation of a true aneurysm[10,18] The occurrence of TBA with PADF in our patient was extremely unusual because his pulmonary TB had been treated with anti-TB medication for 6 months and there had been no evidence of reactivation according to imaging and sputum culture for 1 year. However, reactivation of TB, rather than re-infection, was highly suspected.

The noninvasive diagnostic options for PADF include endoscopy, capsular endoscopy, abdominal CT and aortography.[16,19–23] However, no single modality is good enough to make a diagnosis. Upper gastrointestinal endoscopy is important for exclusion of common causes of upper gastrointestinal bleeding, but the diagnostic sensitivity for AEF is only around 25%.[24] Endoscopy images that might be suggestive of PADF are presentation of an active bleeding site, adherent blood clot, ulcer combined with a blood-filled stomach, and erosion with an eccentric pulsating mass protruding through the duodenum.[12,16,25] In our review, upper gastrointestinal endoscopy was performed in three cases who presented with herald bleeding, and additional colonoscopy was performed in one of them. However, only in our patient was the bleeder identified, but we still failed to make the diagnosis of PADF because of the atypical endoscopic picture. A high degree of suspicion to examine the distal part of the duodenum has the potential to lead to a successful endoscopic diagnosis.

CT scan and angiography are also helpful for diagnosis. Some patients were diagnosed only by imaging examinations, without endoscopy.[21,22] The six signs for AEF include: (1) periaortic ectopic

gas; (2) periaortic soft tissue/fluid >5 mm in thickness; (3) loss of the fat pad between the aorta and intestine; (4) breach in the aorta wall; (5) pseudoaneurysm formation; and (6) intravasation of intravenous contrast into the intestinal lumen. The sensitivities and specificities of CT for the diagnosis of primary AEF were 50–94% and 85–100%, respectively.[22,23] The role of interventional radiology in the identification and treatment of fistula is unclear because of a paucity of reports and experience.

Usually, most patients with PADF are diagnosed by surgical findings. According to a retrospective review of 368 reported cases, 62% of AEF cases were confirmed by exploratory laparotomy. Diagnoses made by upper gastrointestinal endoscopy and CT comprised only 12% and 11%, respectively.[24] All of the five cases in our review were diagnosed by laparotomy. Usually, surgical laparotomy leads to final diagnosis and successful treatment. Surgical treatment for primary AEF include: (1) *in situ* graft; (2) extra-anatomic bypass; (3) closure of defect alone; and (4) endovascular stent graft. The surgical mortality rate is reported to be 13–58%.[18] The overall mortality rate of TBA with PADF is unclear. Recurrence following treatment is rare. In our review, two of the five cases (40%) died as a result of postoperative complications. The others, including our patient, survived disease-free following operation and anti-TB medication. The combination of surgical intervention with long-term anti-TB medical treatment provides a better outcome.[18]

In summary, TBA with PADF is a rare cause of upper gastrointestinal bleeding. Presentation of herald gastrointestinal bleeding, history of TB infection or aortic aneurysm and a high degree of suspicion can increase the likelihood of a clinical diagnosis. Upper gastrointestinal endoscopy, CT scan or aortography may be helpful in diagnosing the condition before operation. Early diagnosis and surgical exploration are needed for timely and successful management. Surgical treatment combined with prolonged anti-TB therapy leads to a positive outcome.

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