Novel surgical treatment of abdominal aortic aneurysm complicated with primary aorto-colonic fistula
A case report

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Abstract
Rationale: Primary aorto-colonic fistula is a rare complication of an abdominal aortic aneurysm. Without surgical treatment, the associated mortality rate is 100%. Even if patients receive timely surgical treatment, they may still die of complications such as infection.

Patient concerns: A 65-year-old male patient was transferred to our hospital because of massive hematochezia and abdominal pain.

Diagnoses: Aortic computed tomography angiography demonstrated abdominal aortic aneurysm complicated with aorto-enteric fistula.

Interventions: We used a gelatin-impregnated knitted vascular prosthesis to re-establish the aneurysm in its original position combined with local drainage to treat the fistula.

Outcomes: The patient had an uneventful postoperative course, and there was no recurrence during the 18-month follow-up.

Lessons: This surgical treatment is suitable for patients with abdominal aortic aneurysms complicated with primary aorto-colonic fistula in which the intestine is very difficult to repair or resect.

Abbreviation: CTA = computed tomography angiography.

Keywords: abdominal aortic aneurysm, aorto-colonic fistula, surgical treatment

1. Introduction
Primary aorto-enteric fistula is a rare complication of an abdominal aortic aneurysm. Despite its rarity, it is an important complication, as it is usually fatal unless detected. Primary aorto-colonic fistula causes spontaneous rupture of an abdominal aortic aneurysm into the lumen of the adjacent colon loop. The formation of a fistula between the aorta and the colon is extremely rare. Hence, diagnosis and management of abdominal aortic aneurysm complicated with primary aorto-colonic fistula is very challenging. Without surgical treatment, its mortality rate reaches 100%. Even if patients undergo timely surgical treatment, they may still die of complications such as infection. In patients with a giant aneurysm, severe adhesion, and difficulty in resection of the intestine, finding a more effective treatment is still a challenge for surgeons. Herein, we describe the successful treatment of a patient with abdominal aortic aneurysm complicated with primary aorto-colonic fistula.

2. Case presentation
A 65-year-old male patient was transferred to our hospital because of massive hematochezia and abdominal pain. His medical history was remarkable for hypertension, diabetes, and coronary artery disease (a stent was implanted in the anterior descending branch 6 years ago). He had no history of abdominal surgery. He had hematochezia twice before admission. The first episode of hematochezia (volume, about 700mL) occurred 1 month before admission, but gastroscopy and colonoscopy findings were negative at a local hospital. Further examination was not performed, as he did not experience any discomfort. Unfortunately, hematochezia (volume, about 800mL) recurred. Subsequently, he was immediately transferred to our hospital. On arrival, his blood pressure was 100/60 mm Hg and heart rate was 95 beats/min. Laboratory investigation indicated hemoglobin level of 7.1mg/dL, hematocrit level of 20.4%, and leukocyte count of 5500/mm3. On physical examination, the patient complained of abdominal pain and tenderness, and an abdominal pulsating mass was evident. Aortic computed tomography angiography (CTA) detected an infra-renal abdominal aortic aneurysm measuring 10 × 8cm2 with calcification. The abdominal aortic aneurysm was ruptured (Fig. 1A). Much of its contents
the descending colon and aneurysm was evident at the left aneurysm had an in debrided, and the lumbar artery was sutured. A finally, blood and clots were evacuated, the aneurysmal site was both common iliac arteries, the aneurysm was incised longiti-

dedema and adhesion on the surrounding tissue. After clamping the proximal segments of the aneurysm and the distal segments of the aneurysm measuring about 10 cm. The abdominal aorta was reconstructed with a gelatin-impregnated knitted vascular prosthesis (16 × 8 mm; Bifurcate, Vascutek Limited, Inchinnan, United Kingdom) in its original location, and an end-to-end anastomosis was performed in the proximal and distal anastomoses (Fig. 2A). A vascular prosthesis segment was used to cover the proximal anastomosis (Fig. 2B). Then, the omentum was utilized to cover the vascular prosthesis and the aneurysmal sac (Fig. 2C). After indwelling the drainage tube in the Douglas pouch, incisions were closed as per routine.

Postoperatively, the patient was instructed to fast and receive parenteral nutrition for 1 month, combined with omeprazole and somatostatin. Results of the intraoperative bacterial culture showed *Escherichia coli*, and blood cultures indicated hemolytic *Staphylococci*. According to the result of the antimicrobial susceptibility tests, vancomycin and ornidazole were prescribed as anti-infection therapy. The drainage tube in the Douglas pouch was removed on postoperative day 5. The drainage fluid of the aneurysmal sac was brown, yellow, and odorous; hence, metronidazole (250 mL) and saline (500 mL) were used to irrigate the aneurysmal sac 3 times per day. On postoperative day 20, the drainage fluid was clean and odorless; hence, irrigation of the aneurysmal sac was discontinued. Then, human growth hormone was administered intravenously for 2 weeks. On postoperative day 46, retrograde radiography with lipiodol injected in the aneurysmal drainage tube showed a sinus (Fig. 3A). The patient was discharged on postoperative day 58; his leukocyte count was normal, he had no fever, the result of the repeat blood culture was negative, and he had a normal diet. Three months postoperatively, retrograde radiography with lipiodol injected into the aneurysmal drainage tube was performed again, and the sinus had disappeared (Fig. 3B); therefore, the aneurysmal drainage tube was removed. The postoperative course was uneventful without complications. The patient had no recurrence at the 18-month follow-up, and the results of aortic CTA (Fig. 3C) and trans-rectal colon retrograde radiography (Fig. 3D) were satisfactory.

This case report was a retrospective observation of a patient. Hence, ethics approval was not needed. Informed consent was obtained from the patient himself.

### 3. Discussion

Primary aorto-enteric fistula is a rare and life-threatening complication of abdominal aortic aneuersms, with a morbidity rate of 0.04%–0.07%.[2] Mirarchi et al[3] reported that aneurysms as small as 3 cm in diameter can cause primary aortic-enteric fistula. The third portion of the duodenum, which retroperitoneally is in close contact with the abdominal aorta, is the most frequently affected bowel segment. A fistula less commonly develops in the jejunum and rarely beyond it. Notably, the diagnosis of an aorto-enteric fistula relies on a high index of suspicion because its signs and symptoms are obscure and atypical. The classic triad of gastrointestinal hemorrhage, abdominal pain, and pulsatile mass is manifested in only 11% of patients.[4] The most important clinical manifestation of aorto-enteric fistula is “herald” or “premonitory” hemorrhage,
and catastrophic hemorrhage will occur within a few days or weeks later. Herald bleeding is the result of temporary tamponade by the thrombus. Expansion of the fistula and dislodgement of the thrombus due to high blood pressure within the aorta can cause catastrophic hemorrhage.\[5\] In our case, 2 hemorrhages occurred within a month; fortunately, the patient still survived, as the fistula was tamponaded by the thrombus temporarily and we provided prompt and adequate treatment.

Abdominal aortic aneurysm with primary aorta-colonic fistula is rare in the clinical setting; so far, only 2 cases have been reported. Once the diagnosis is definite, emergent operation is crucial. Without operation, the associated mortality rate is 100%. Even if the patients receive timely surgical treatment, they may still die of complications such as infection.\[1\] Mavioglu et al\[6\] reported a case of primary aorto-colic fistula arising from a post-traumatic aortic pseudoaneurysm; the aneurysm was small (about 3.5 cm\(^2\)), and primary enteric repair and aortic reconstruction with an in-situ Dacron graft were used to treat this patient. Kang et al\[7\] reported a case of coexisting aortocolic and aortovesical fistulae in an abdominal aortic aneurysm; they performed aortobiliac bypass, resection of the fistula in the sigmoid colon, and sigmoid colostomy.

The conventional treatment includes repair or resection of the diseased intestine and sigmoid colostomy. However, the conventional treatment is applicable to our patient. In our case, given the giant size of the aneurysm, intense inflammation, and severe edema and adhesion of the surrounding tissue, we had no time for bowel preparation before the operation; therefore, it was very difficult to repair or resect the diseased intestine completely. We resected as many aneurysm walls as possible during the procedure. Then, we sutured the aneurysmal wall at the position of the fistula into a cylindrical aneurysmal sac (diameter, about 2 cm) and indwelled a drainage tube from the cylindrical aneurysmal sac to the exterior side of the abdominal wall. Because the aortic wall could not be used to wrap the vascular prosthesis, we used the vascular prosthetic segment to cover the proximal anastomosis and the omentum to cover the vascular prosthesis and aneurysmal sac. We expected the fistula to heal naturally for the following reasons. First, the vascular prosthetic segment can prevent the formation of adhesion and anastomotic leakage. Second, the omentum contains phagocytic cells and has an anti-infection property; hence, it can prevent recurrence of infection. The obtained result in the present case indicates that using the vascular prosthetic segment and great omentum as a double protective barrier could effectively prevent the recurrence of fistula.

In addition, Ren and Li\[8\] demonstrated that the combination of nutritional support with somatostatin and human growth hormone can promote healing of an intestinal fistula. We used this treatment postoperatively, and combined with irrigation, sufficient drainage, and sensitive antibiotics administered via an intravenous drip, the patient made a full recovery and had no recurrence.

We believe that our treatment—in-situ revascularization combined with local drainage—is an optimal choice for patients with abdominal aortic aneurysm complicated with primary aorto-colonic fistula whose intestine is very difficult to repair or resect. It is a safe and effective surgical treatment.

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**Author contributions**

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Figure 3. (A) Postoperative retrograde radiograph with lipiodol (2 months) showing a sinus. (B) Postoperative retrograde lipiodol radiograph (3 months) showing that the sinus disappeared. (C) Postoperative aortic computed tomography angiogram (18 months) showing satisfactory results. (D) Postoperative trans-rectal colon retrograde radiograph (18 months) showing that the descending colon is filling well and no contrast medium leakage.