Spontaneous Dissection of the Celiac and Hepatic Arteries Treated with Endovascular Treatment Modalities, Including Stent Placement and Transcatheter Arterial Embolization

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Abstract
Symptomatic spontaneous celiac and hepatic artery dissection is a rare condition. It is not known which treatment modalities are the most appropriate. Here, the case of a 64-year-old man who presented to us with a several-month history of epigastralgia is reported. Computed tomography (CT) revealed a fusiform dilated dissection of the celiac and hepatic arteries with a flap. Because of the size of the dissection and the refractory symptoms, an endovascular stent implantation was performed. Eight months after the procedure, CT scans showed a new aneurysmal formation at the proper hepatic artery near the distal edge of the stent. The dissection was isolated by coil packing. This case suggests that endovascular treatment can be feasible in symptomatic patients with isolated spontaneous celiac and hepatic artery dissection.

Key words: Spontaneous dissection, Celiac artery, Hepatic artery, Endovascular treatment
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Introduction
Isolated spontaneous celiac and hepatic artery dissection has been rare [1-4]. Most reported cases have occurred in men, and the cause and natural history of the condition are not well understood [1-4]. It is debated whether surgical or endovascular treatment is more appropriate [2-4]. Here, the endovascular treatment of a spontaneous celiac and hepatic artery dissection in a symptomatic male patient is presented, and the findings are discussed in the context of previously reported cases.

Case Report
A 64-year-old man presented with a several-month history of epigastric pain. His medical history included hypertension, gout, and a previous cholecystectomy for gallstones. Physical examination showed mild epigastric tenderness. Results of laboratory tests, including a complete blood count and basic metabolic profile, were normal except for an increased lipase level of 359 U/L (normal range, 6-51 U/L). His blood pressure was 120/70 mm Hg. The patient was diagnosed with pancreatitis and admitted for observation. Abdominal radiographs and gastrointestinal endoscopy showed nothing unusual. Dynamic contrast-enhanced CT of the abdomen showed celiac artery dissection with a flap that originated approximately 20 mm from the celiac artery ostium (Figure 1). The flap extended from the celiac artery to the proximal proper hepatic artery. There was also a fusiform aneurysmal dilatation of the common hepatic artery with a thrombus. The re-entry was at the distal end of the common hepatic artery. The caliber of the true lumen appeared compromised. The splenic and gastric arteries were clearly patent. No other aneurysms and no other causes of the intraabdominal hemorrhage were visible on the CT scan. There

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was no finding indicating pancreatitis on the CT scan. An extensive evaluation showed no serologic evidence of vasculitis or an inflammatory disorder. Because of the size of the aneurysm and the refractory symptoms, the patient was referred to our institution in December 2015 for endovascular management of the spontaneous celiac and hepatic artery dissection.

A 6-French (Fr) guiding sheath (Parent Plus60; Medikit, Tokyo, Japan) was inserted from the right common femoral artery. The left common femoral artery was accessed, and an 8-Fr introducer sheath (Radifocus Introducer II; Terumo, Tokyo, Japan) was placed to allow quick placement of an aortic occlusion balloon in the event of significant bleeding or manipulation of the celiac artery.

A selective angiogram of the celiac artery showed dissection with irregular fusiform aneurysmal dilation extending from the celiac artery to the proper hepatic artery (Figure 2).

Systemic heparin (3000 units intravenously) was given prior to treatment. A 2.8-Fr microcatheter (Michibiki; Hanako Medical, Saitama, Japan) was selected, and a 0.014-inch microguidewire (CHIKAI black; Asahi Intec, Aichi, Japan) was advanced into the true lumen of the splenic artery. A 6-Fr guiding sheath was advanced into the true lumen of the dissected celiac artery supported in the CHIKAI black microguidewire. Through this sheath, the microcatheter was passed over the microguidewire into the right gastric artery that originated at the proper hepatic artery.

Intravascular ultrasound (IVUS) was used to investigate the extent of the dissection and to confirm the correct placement of the microguidewire within the true lumen. Next, the microcatheter was exchanged for a 5-Fr straight catheter (Excellent EN catheter; Hanako Medical, Saitama, Japan) and the microguidewire was replaced by a 0.035-inch hydrophilic coating guidewire (Radifocus guidewire; Terumo Co., Tokyo, Japan).

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A 6-Fr guiding sheath (Parent Plus60; Medikit, Tokyo, Japan) was inserted from the right common femoral artery. Imaging with digital subtraction angiography (DSA) of the celiac artery confirmed the proximal proper hepatic artery near the distal edge of the stent (Figure 4). To prevent aneurysm rupture, coil embolization was performed. A 6-Fr guiding sheath (Parent Plus60; Medikit, Tokyo, Japan) was inserted from the right common femoral artery. Imaging with digital subtraction angiography (DSA) of the celiac artery confirmed the location of the new aneurysmal formation at the proper hepatic artery near the distal edge of the stent (Figure 5).

After hyperselective catheterization of the right gastric artery and the right gastroepiploic artery, isolation of the aneurysm was performed by packing the true and false lumens with 38 platinum coils (0.018-inch) with diameters of 2, 4, 5, 6, 7, and 8 mm.

An angiogram obtained after transarterial embolization (TAE) showed that the dissection was obliterated and that the intrahepatic branches were supplied through collateral pathways of the epicholedochal arterial plexus from the gastroduodenal artery and the dorsal pancreatic artery, and a

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**Figure 1.** Dynamic computed tomography (CT) shows arterial dissection with a flap from the celiac artery to the proximal proper hepatic artery, as well as fusiform aneurysmal dilatation with thrombus of the common hepatic artery.

**Figure 2.** Selective angiogram of the celiac artery. Dissection with irregular fusiform aneurysmal dilation extends from the celiac artery to the proper hepatic artery.
small residual false lumen at the proximal portion of celiac artery (Figure 6).

The patient’s postoperative course was uneventful, and no increase in the serum transaminase level was noted. The patient was discharged 2 days later. Contrast-enhanced CT scans 6 months later showed complete exclusion and thrombosis of the dissecting aneurysm.

**Discussion**

Isolated celiac artery dissection has been considered very rare [1-4]. In a review of the literature, 40 cases of spontaneous dissection of the celiac artery have been reported. However, increased use of high-resolution vascular imaging modalities may be contributing to the recent increase in reports; suggesting that the incidence may have been underestimated in the past [1, 3].

The most common symptom is the sudden onset of severe epigastric or hypochondral pain. Most physical examinations yield normal results except for epigastric tenderness [1-4]. The natural progression of spontaneous celiac and hepatic artery dissection is not fully known. Severe sequelae include splenic infarction, intraperitoneal hemorrhage, and intestinal
ischemia [2]. Takeda et al. reported that 11 of 13 patients with primary hepatic artery dissection did not survive [5, 6]. Six died of rupture of the hepatic artery dissection. One patient was successfully treated surgically [6]. After hepatic artery dissection, conservative therapy alone is not justified and either surgery or TAE should be performed unless there is a risk of hepatic infarction due to hepatofugal flow in the portal vein secondary to portal vein thrombosis.

The optimal treatment for spontaneous celiac and hepatic artery dissection has not yet been established [2-3, 7-8]. Surveillance, surgical intervention, or endovascular repair may be indicated, depending on the clinical features [2]. For some authors, patients with asymptomatic lesions are candidates for imaging surveillance [2, 8]. In contrast, symptomatic dissection with persistent pain, expansion of a false lumen, or aneurysmal dilation and rupture, as in the present report, warrant immediate operative or endovascular intervention [7].

Endovascular interventions are currently considered the method of choice for first-line treatment of dissecting celiac artery aneurysms (CAAs) ≥2 cm in diameter to prevent rupture [7, 9]. In the Mayo Clinic’s series of 18 CAAs, ruptures occurred in 2 patients, both of whom had true CAAs ≥ 2 cm in diameter [9]. In the literature, the 2 cm threshold appears quite arbitrary and no treatment indications based on the size of the pseudolumen have been described.

Endovascular treatment has numerous potential benefits compared to surgical interventions: the intervention can be done with local anesthesia, collateral circulation is easily estimated with selective splanchnic arteriography during the procedure, fewer postoperative complications occur, and hospital stays are shorter [3].

Appropriate patient selection is crucial for the technical success and safety of endovascular interventions. Contraindications for endovascular interventions are the presence of a stenotic or occluded superior mesenteric artery or gastroduodenal artery. Patency of these arteries is necessary to provide collateral flow to the pancreas, liver, and spleen. The shape of the CAA is also significant. This technique would not be appropriate for CAAs with a wide neck because the coils could not be anchored [3]. However, a recent report documented the use of a stent graft to treat a true CAA with a wide neck [10].

Recent articles about isolated celiac artery dissections, including branches of the celiac and hepatic arteries, stated that initial conservative treatment seems adequate for most cases [11]. In our case, due to the size of the aneurysm and the refractory symptoms which were thought to be caused by stenosis of the true lumen, we decided to perform endovascular treatment. The patient’s flap extended from the celiac artery to the proximal proper hepatic artery. We were afraid of blood flow disturbance to multiple organs, i.e., the spleen, stomach, pancreas, and liver, following the initial coil embolization/stent graft implantation. For this reason, the bare stent was first placed at the dissection site to reduce stenosis of true lumen. Thrombosis of the false lumen was expected.

The aneurysmal formation of the distal edge of stent might be not coincidental but complications. We might place a stent more distal healthy portion.

This case provides an example of the successful use of endovascular intervention to treat celiac artery dissection by placing a stent followed by coil embolization. We did experience complications at the distal edge of the stent and, if possible, recommend placing the stent more distal to the dissection.

Conflict of interest: The authors declare that they have no conflicts of interest to report.

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References