Spontaneous celiac artery dissection treated by balloon angioplasty

Regina Husman, MD, Akiko Tanaka, MD, PhD, S. Keisin Wang, MD, Kourosh Keyhani, DO, *and* Arash Keyhani, DO, *Houston, TX*

ABSTRACT

Spontaneous isolated celiac artery dissection (SICAD) is a rare condition, defined as dissection of the celiac artery without aortic involvement. Because of its low prevalence, most studies have been limited to case reports and case series. We have described the case of a 44-year-old woman who had presented with symptomatic SICAD that had resulted in compromised flow to the hepatic arteries and was successfully treated with balloon angioplasty. Angioplasty alone might be effective for cases of extensive false lumen thrombosis in SICAD for immediate flow restoration to the true lumen, expediting positive remodeling. (J Vasc Surg Cases Innov Tech 2022;8:850-3.)

Keywords: Balloon angioplasty; Celiac artery dissection; SICAD

Spontaneous isolated celiac artery dissection (SICAD) is a rare condition, characterized by dissection of the celiac artery without the involvement of the aorta. It has been associated with hypertension, smoking, atherosclerosis, abdominal surgery, trauma, fibromuscular dysplasia, connective tissue disease, pregnancy, vasculitis, tumors, and cystic fibrosis medial necrosis.[1] The incidence of isolated dissection of the viscera has been <0.1% at autopsy, and superior mesenteric artery dissection has been found more often than celiac artery dissection. However, many case reports and case series have combined SICAD with concomitant superior mesenteric artery dissection, making it difficult to determine the natural history, prognosis, and appropriate treatment strategy for SICAD.[2-4] In the present report, we have described the case of a 44-year-old woman who had presented with symptomatic SICAD that had resulted in compromised flow to the hepatic arteries and was successfully treated with balloon angioplasty. The patient provided written informed consent for the report of her case details and imaging studies.

CASE REPORT

A 44-year-old woman had presented to the emergency room with a 2-week history of intermittent abdominal pain. Her symptoms had acutely worsened the morning of her presentation, with the pain radiating to her back, nausea, and vomiting. Her medical history was notable for chronic anemia, secondary to abnormal uterine bleeding from uterine leiomyoma. She had no history of a prior surgical intervention. She denied recent trauma, hypertension, drug and tobacco use, and a family history of connective tissue disease or vasculopathy. Physical examination revealed mild tenderness to palpation in the right upper quadrant. Her vital signs were within normal limits, and the laboratory tests revealed a mildly elevated white blood cell count of $11.2 \times 10^3/\mu L$. The liver enzymes were within normal limits. The findings from a right upper quadrant ultrasound were unremarkable, and a computed tomography (CT) scan of the abdomen and pelvis with intravenous contrast was obtained. The CT findings were remarkable for an isolated distal celiac artery dissection with extension into the common and proper hepatic arteries. Thrombosis of the false lumen and severe narrowing of the true lumen in the proximal common and proper hepatic arteries were present. However, residual minimal flow was visualized in the hepatic arteries, arising from a patent pancreaticoduodenal arcade (Fig 1).

The patient was admitted for conservative management with intravenous heparin administered because no biochemical or imaging findings were concerning for hepatic or gallbladder ischemia. However, on hospital day 2, the patient had continued to have worsening abdominal pain and intractable nausea and vomiting. Therefore, we decided to proceed with endovascular intervention.

Transfemoral access was performed for access into the abdominal aorta. Selective angiography of the celiac trunk revealed findings consistent with dissection and minimal flow in the common hepatic artery (Fig 2). A steerable sheath,

From the Division of Vascular Surgery, Department of Cardiothoracic and Vascular Surgery, John P. and Kathrine G. McGovern Medical School, The University of Texas Health Science Center at Houston.

Author conflict of interest: none.

Presented at the Society for Clinical Vascular Surgery Forty-ninth Annual Symposium, Las Vegas, NV, March 18-23, 2022.

Correspondence: Arash Keyhani, DO, FACS, Division of Vascular Surgery, Department of Cardiothoracic and Vascular Surgery, John P. and Kathrine G. McGovern Medical School, The University of Texas Health Science Center at Houston, 1631 N Loop W, Ste 610, Houston, TX 77008 (e-mail: Arash.Keyhani@uth.tmc.edu).

The editors and reviewers of this article have no relevant financial relationships to disclose per the Journal policy that requires reviewers to decline review of any manuscript for which they may have a conflict of interest.

2468-4287

https://doi.org/10.1016/j.jvscit.2022.10.001

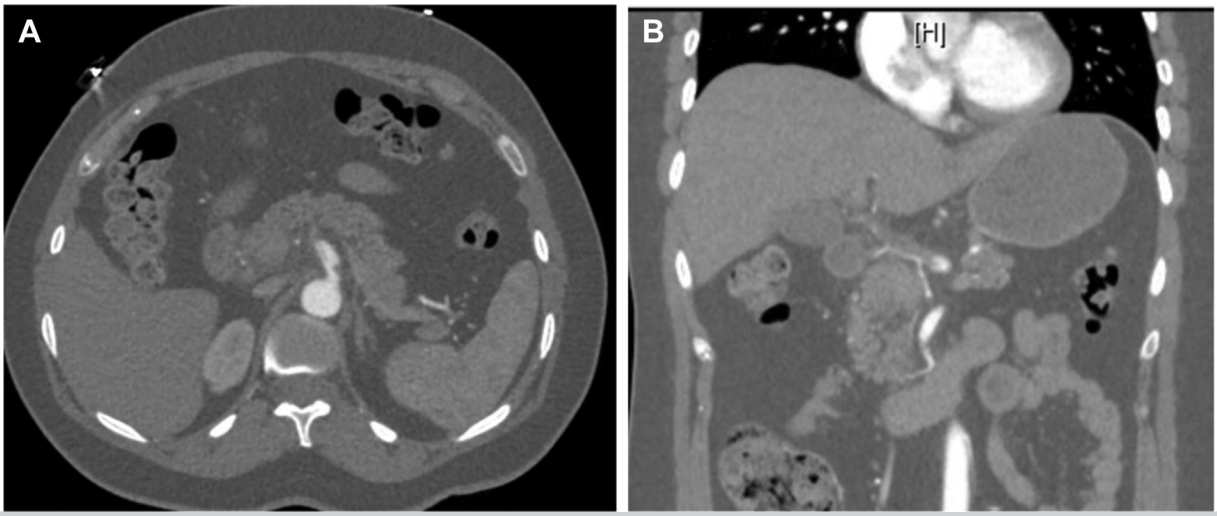

Fig 1. Preoperative axial **(A)** and coronal **(B)** computed tomography angiography (CTA) showing distal celiac artery dissection with extension to the common and proper hepatic arteries. This resulted in limitation of flow and reconstitution of the left and right hepatic arteries from the pancreaticoduodenal arcade.

microcatheter, and guidewire were used to cannulate the true lumen of the celiac artery into the common and proper hepatic arteries. Balloon angioplasty was performed on the common and proper hepatic arteries using a 3- and 4-mm balloon, respectively. Angiography after the intervention revealed persistent dissection of the proximal celiac artery, with restoration of flow into the common and proper hepatic arteries (Fig 2). Although residual dissection was noted in the celiac artery, it was not flow limiting and did not result in compromised flow to the splenic artery or left gastric artery. Because of the small size of the common and proper hepatic arteries, we decided not to proceed with additional stenting.

After treatment, the patient's abdominal pain had resolved, and she tolerated a regular diet well. No postoperative complications developed, and the patient was discharged 4 days after the endovascular intervention with a prescription for rivaroxaban (Xarelto; Bayer HealthCare AG, Leverkusen, Germany). Follow-up CT angiography (CTA) at 9 months after the procedure revealed minimal residual proximal dissection of the celiac artery, with almost complete resolution of the dissection in the common hepatic artery and proper hepatic artery (Fig 3). The patient reported complete resolution of her symptoms during follow-up, and CTA performed at those follow-up visits revealed continued patency of the common hepatic artery.

DISCUSSION

We have described the case of a woman who had presented with symptomatic SICAD. Patients with SICAD can be asymptomatic or can present with acute abdominal pain radiating to the back, nausea and vomiting, or loss of appetite.[5-7] The complications of SICAD include splenic infarction, gallbladder necrosis, and hepatic and intestinal ischemia.[6-8] The use of CTA can confirm the diagnosis and aid in operative planning, determination of involvement of other vessels, and detection of anatomic variations and collateral flow. Because of the lack of a surgical specimen, the etiology for the present case remained unknown. However, considering her relatively young age, our patient likely had had a connective tissue disorder or segmental arterial mediolysis.

Nonoperative management, with or without antiplatelet or anticoagulation therapy, endovascular stenting, and open surgical revascularization are all treatment options for SICAD. A meta-analysis performed by Wang et al[9] found that 8% of patients initially managed with medical treatment had required subsequent intervention. Endovascular techniques have virtually replaced surgical bypass and patch angioplasty as the primary treatment of SICAD in the present era. Multiple endovascular therapies have been described, including stenting (covered and uncovered), balloon fenestration, and transcatheter embolization (if aneurysmal).[10-12] Most investigators have advocated for conservative management, reserving intervention for patients with persistent pain, aneurysmal degeneration, or evidence of end-organ ischemia.

Our patient had continued to have abdominal pain and intractable nausea and vomiting despite medical management. Therefore, the decision was made to intervene. Because our patient was planning to undergo hysterectomy in the future to treat her abnormal uterine bleeding, we attempted endovascular revascularization first, with open surgery reserved if those efforts were unsuccessful.

In the present patient, the magnitude of the dissection and thrombosed false lumen was widespread, extending from the celiac axis origin to the proper hepatic artery, which could have resulted in early ischemia of the liver and gallbladder. The goal of treatment was to compress the false lumen to allow for flow to the true lumen of the

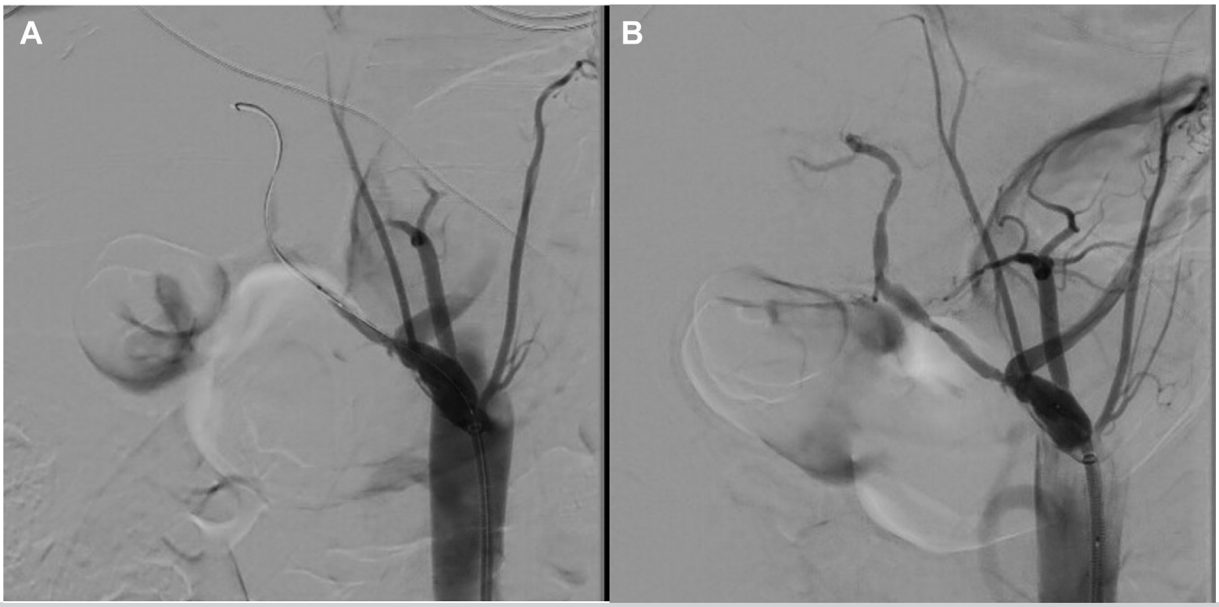

Fig 2. Pre- **(A)** and post-treatment **(B)** selective angiograms of the celiac trunk demonstrating improved flow in the common and proper hepatic arteries after treatment with balloon angioplasty.

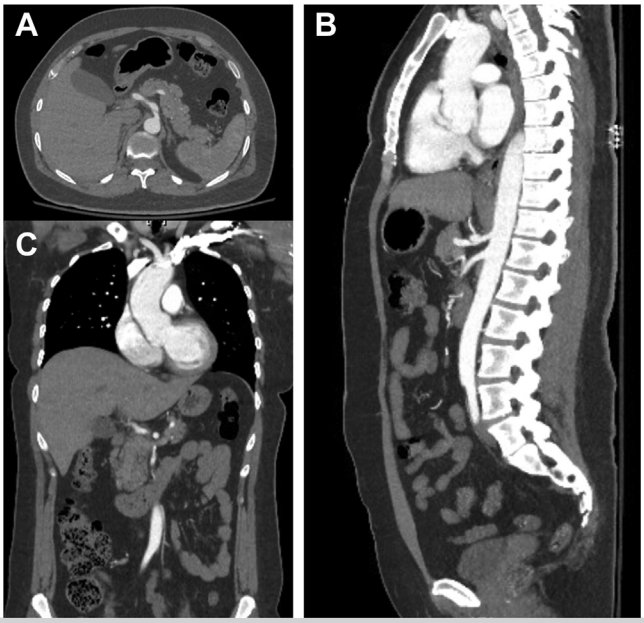

Fig 3. Postoperative axial **(A)**, sagittal **(B)**, and coronal **(C)** images of computed tomography angiography (CTA) performed 9 months after procedure showing minimal residual proximal celiac artery dissection with patent common hepatic artery and proper hepatic artery and resolution of dissection in the segment.

common hepatic and proper hepatic arteries. Although some investigators have described the placement of a covered stent, we elected to proceed with angioplasty alone owing to the small diameter of the vessel and the risk of stent thrombosis. The outcome of balloon angioplasty alone during follow-up was deemed effective, with near-complete resolution of the dissection and flow restored to the common hepatic artery.

CONCLUSIONS

Our case report contributes to the limited literature on endovascular treatment of SICAD with balloon angioplasty alone, which can be effective in cases of extensive thrombosis to allow for immediate flow restoration to the true lumen, expediting positive remodeling.

REFERENCES

1. Wang HT, Yu ZH, Tu C, Lu B. Interventional treatment of isolated dissection of the celiac artery: a case report and literature review. Medicine (Baltimore) 2018;97:e11026.
2. Wang HC, Chen JH, Hsiao CC, Jeng CM, Chen WL. Spontaneous dissection of the celiac artery: a case report and literature review. Am J Emerg Med 2013;31:1000.e3-5.
3. Verde F, Bleich KB, Oshmyansky A, Black JH, Fishman EK, Johnson PT. Isolated celiac and superior mesenteric artery dissection identified with MDCT: imaging findings and clinical course. J Comput Assist Tomogr 2012;36:539-45.
4. Oh S, Cho YP, Kim JH, Shin S, Kwon TW, Ko GY. Symptomatic spontaneous celiac artery dissection treated by conservative management: serial imaging findings. Abdom Imaging 2011;36:79-82.
5. Kang TL, Teich DL, Mcgillicuddy DC. Isolated, spontaneous superior mesenteric and celiac artery dissection: case report and review of literature. J Emerg Med 2011;40:e21-5.
6. D'Ambrosio N, Friedman B, Siegel D, Katz D, Newatia A, Hines H. Spontaneous isolated dissection of the celiac artery: CT findings in adults. AJR Am J Roentgenol 2007;188:W506-11.
7. Mousa AY, Coyle BW, Affuso J, Haser PB, Vogel TR, Graham AM. Nonoperative management of isolated celiac and superior mesenteric artery dissection: case report and review of the literature. Vascular 2009;17:359-64.
8. Glehen O, Feugier P, Aleksic Y, Delannoy P, Chevalier JM. Spontaneous dissection of the celiac artery. Ann Vasc Surg 2001;15:687-92.
9. Wang J, He Y, Zhao J, Yuan D, Xu H, Ma Y, et al. Systematic review and meta-analysis of current evidence in spontaneous isolated celiac and superior mesenteric artery dissection. J Vasc Surg 2018;68:1228-40.e9.

10. Takach TJ, Madjarov JM, Holleman JH, Robicsek F, Roush TS. Spontaneous splanchnic dissection: application and timing of therapeutic options. J Vasc Surg 2009;50:557-63.
11. So YH, Chung JW, Park JH. Balloon fenestration of iatrogenic celiac artery dissection. J Vasc Interv Radiol 2003;14:493-6.
12. Takeda H, Matsunaga N, Sakamoto I, Obata S, Nakamura S, Hayashi K. Spontaneous dissection of the celiac and hepatic arteries treated by transcatheter embolization. AJR Am J Roentgenol 1995;165:1288-9.

Submitted Apr 20, 2022; accepted Oct 3, 2022.