

Address for correspondence Divya Kumari, MD, 5841 S. Maryland

Avenue, MC 2026, Chicago IL 60636, United States (e-mail: dkumari@radiology.bsd.uchicago.edu).



Recurrent IPDA Aneurysm from Celiac Occlusion Treated by a Flow Diverting Stent

Divya Kumari¹ Brian Funaki¹

¹ Department of Radiology, Vascular and Interventional Radiology, University of Chicago Medicine, Chicago, Illinois, United States

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Abstract

Keywords

mesenteric aneurysm

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celiac stenosis

Inferior pancreaticoduodenal artery (IPDA) aneurysms have been associated with celiac axis stenosis and occlusion. Retrograde flow through the IPDA arcade has been hypothesized to cause enlargement of these vessels and lead to aneurysm formation. However, objective proof of this hypothesis is lacking, given the fact that celiac stenosis or occlusion and IPDA aneurysms are typically diagnosed concurrently and recurrent aneurysms have not been described. This report presents a patient with celiac axis stenosis and an IPDA aneurysm treated with median arcuate ligament lysis, celiac stenting, and aneurysmectomy. Seventeen years later, he developed a second IPDA aneurysm treated with a flow diverting stent.

Introduction

Inferior pancreaticoduodenal artery (IPDA) aneurysms are rare splanchnic aneurysms. Unlike other aneurysms, the risk of rupture is independent of the aneurysmal diameter. IPDA aneurysms have been associated with altered blood flow due to celiac trunk stenosis in the affected branches. In this setting, single or multiple aneurysms can exist. Treatment options include surgical ligation or endovascular treatment. An endovascular approach is favored due to a lower morbidity rate of the procedure.

Case Report

A 72-year-old man presented to the IR clinic complaining of abdominal pain. He experienced similar pain 17 years earlier when he was found to have celiac stenosis and a 3 cm inferior pancreaticoduodenal artery (IPDA) aneurysm (**>Fig. 1**). After the initial diagnosis, the patient underwent aneurysm resection, ligament division, and celiac stenting. The patient's pain resolved following the inter-

ventions; however, after a 15-year absence, the pain slowly returned over a 2-year period. He underwent computed tomography angiography (CTA) demonstrating occlusion of the celiac stents and interval development of a new 1.5 cm IPDA aneurysm. Angiography was performed confirming celiac stent occlusion with retrograde flow through the IPDA to branches of the celiac axis. The occluded stents could not be recanalized. Given the patient's recurrent abdominal pain, preservation of flow through the pancreaticoduodenal arcade was desirable. As such, instead of embolization, the aneurysm was treated with a flow diverting stent. A 7 French guiding catheter (Rist, Medtronic, Irvine, CA), 4.7 French intermediate catheter (Phenom Plus, Medtronic), and 3.1 French braided microcatheter (Phenom, Medtronic) were used in triaxial fashion to catheterize the IPDA through the aneurysm. Subsequently, a $4.5 \text{ mm} \times 30 \text{ mm}$ Pipeline Flex (Medtronic) embolization device was deployed across the aneurysm (\succ Fig. 2). The patient was maintained on dual antiplatelet agents for 6 months.

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Fig. 1 (A) Initial sagittal reconstruction of CTA from 17 years ago reveals compression of the celiac axis from median arcuate ligament (red arrow) and IPDA aneurysm (yellow arrow). (B) Lateral aortogram demonstrating celiac stenosis (red arrow) and IPDA aneurysm (yellow arrow). (C) Lateral aortogram after stenting shows patent celiac artery stent.



Fig. 2 (A) IPDA angiogram demonstrates a recurrent aneurysm that has developed in the setting of celiac stent occlusion. (B) Fluoroscopic image of a flow diverting stent positioned across the aneurysm using a triaxial catheter system and a correlating schematic overlay of the triaxial system over the angiogram. (C) Angiogram after flow diverting stent deployment angiogram confirming successful exclusion of the aneurysm.

Discussion

IPDA aneurysms are rare but often associated with celiac stenosis or occlusion from median arcuate ligament compression or atherosclerotic disease.¹⁻⁴ It has long been hypothesized that retrograde flow through the IPDA arcade causes enlargement of these small vessels and promotes aneurysm development.^{1,2,4} However, objective proof of this hypothesis is lacking given the fact that celiac stenosis or occlusion and IPDA aneurysms are most often diagnosed concurrently. In this patient, the unique opportunity to document baseline anatomy followed 17 years later with subsequent enlargement of the arcade and aneurysm development supports this hypothesis. The patient's initial CTA demonstrated a high-grade, short-segment celiac stenosis likely from median arcuate ligament compression as well as a 3 cm IPDA aneurysm. After the patient underwent ligament division, aneurysm repair and celiac stenting, a CTA 1 year later showed patent stents and no evidence of residual or recurrent aneurysms. After presenting with recurrent abdominal pain 17 years subsequently, a CTA revealed occlusion of the celiac stents and interval development of a 1.2 cm

new IPDA aneurysm, supporting causation of the aneurysm from the celiac occlusion.

The treatment of IPDA aneurysms is important as these may rupture, irrespective of size, causing acute abdominal pain and life-threatening hemorrhage.¹⁻³ Embolization is the recommended treatment due to low morbidity in comparison to surgical repair.¹ If the aneurysm sac cannot be embolized, the parent artery can be occluded, typically with coils, preferably with embolization of the inflow and outflow to prevent reperfusion of the aneurysm.¹ In this case, a flow diverting stent was used instead of embolization to preserve retrograde flow to the celiac axis while excluding the aneurysm. Flow diverting stent are commonly used for wideneck, large or giant aneurysms of the internal carotid artery. These devices promote aneurysm occlusion by decreasing direct jet blood flow into the aneurysm and promoting laminar flow along the stent in the parent artery, thereby diverting the flow. The diversion of blood flow results in stagnation of blood within the aneurysm promoting thrombosis. The decreased wall stress and stagnation of flow results in aneurysm remodeling and endothelialization across the aneurysm neck.⁵

Conflict of Interest None declared.

References

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