

Prominent gastroduodenal artery: Endosonographic sign of celiac artery stenosis

Can Gonen, Ali Sürmelioglu¹, Metin Tilki¹, Gamze Kiliçoğlu²

Departments of Gastroenterology, ¹General Surgery, and ²Radiology, Haydarpaşa Numune Training and Research Hospital, Istanbul, Turkey

ABSTRACT

Celiac artery (CA) stenosis is a relatively common finding in patients undergoing pancreaticoduodenectomy (PD). In the presence of CA stenosis, arterial blood supply to the celiac territory is usually sustained from the superior mesenteric artery (SMA) through well-developed collaterals. In this paper, the authors report endosonographically identified prominent gastroduodenal artery as the sign of CA stenosis for the first time. Uncovering previously unidentified vascular abnormality, endoscopic ultrasound (EUS) has improved patient management. The patient had uneventful collateral preserving PD.

Key words: Celiac artery (CA), collateral circulation, endoscopic ultrasound (EUS), pancreatic cancer, pancreaticoduodenectomy (PD), stenosis

INTRODUCTION

Celiac artery (CA) stenosis is a relatively common finding in patients undergoing surgery.^[1] In the presence of CA stenosis, arterial blood supply to the celiac territory is usually sustained from the superior mesenteric artery (SMA) through well-developed pancreaticoduodenal collaterals and the gastroduodenal artery [Figure 1]. During pancreaticoduodenectomy (PD), most of these collateral vessels are ligated and cut, potentially causing ischemia of the liver, biliary tree, or anastomosis. We present a case highlighting the importance of prominent and thickened gastroduodenal artery detected by endoscopic ultrasound (EUS) as the only sign of CA stenosis.

CASE REPORT

A 75-year-old female presented with abdominal pain. Contrast-enhanced computed tomography (CT) of the abdomen revealed pancreatic ductal dilatation and irregularity, but no obvious obstructing mass lesion. EUS examination revealed a 15 mm × 12 mm hypoechoic tumor located in the pancreatic head with a ductal dilatation of 6 mm. During EUS examination, a prominent and dilated gastroduodenal artery with a diameter of 7 mm was noticed [Figure 2]. Reevaluation of the abdominal CT did not

This is an open access article distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 3.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as the author is credited and the new creations are licensed under the identical terms.

For reprints contact: reprints@medknow.com

How to cite this article: Gonen C, Sürmelioglu A, Tilki M, Kiliçoğlu G. Prominent gastroduodenal artery: Endosonographic sign of celiac artery stenosis. *Endosc Ultrasound* 2016;5:339-41.

Access this article online

Quick Response Code:



Website:

www.eusjournal.com

DOI:

10.4103/2303-9027.191674

Address for correspondence

Dr. Can Gonen, Department of Gastroenterology, Haydarpaşa Numune Training and Research Hospital, Tibbiye Caddesi, No: 40, Üsküdar, Istanbul - 34668, Turkey. E-mail: drcggn@yahoo.com

Received: 2015-01-03; **Accepted:** 2015-12-03

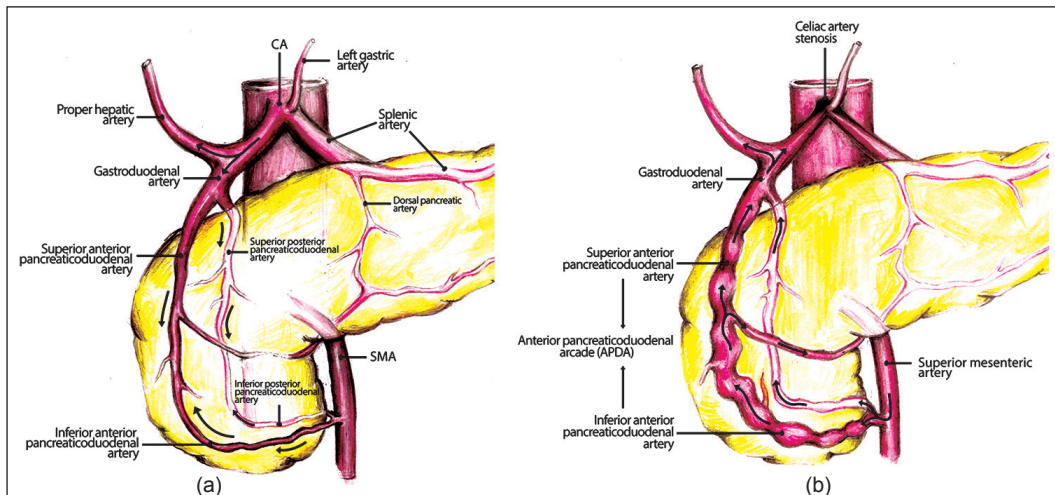


Figure 1. (a) Simplified vascular anatomy of the celiac artery (CA) and the superior mesenteric artery (SMA) (b) Collateral blood supply of the celiac territory in the presence of the celiac artery (CA) stenosis. Prominence of gastroduodenal artery and anterior pancreaticoduodenal arcade (APDA)

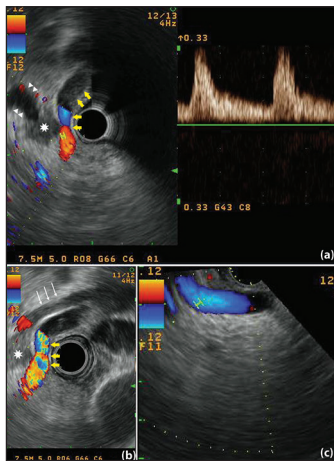


Figure 2. (a and b) Radial EUS image. A 15 mm × 12 mm sized hypoechoic tumor (white star) causing pancreatic ductal dilatation (arrowheads). Portal vein (white arrows), prominent gastroduodenal artery (yellow arrows), and pulse wave Doppler spectrum of the gastroduodenal artery are shown (c) Linear EUS image of the gastroduodenal artery; note the reverse flow toward the hepatic hilum

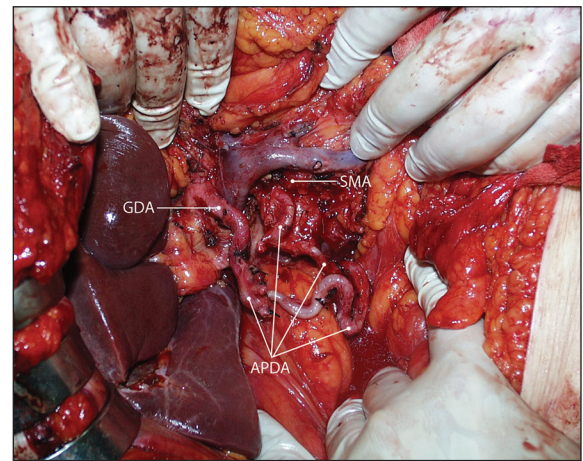


Figure 3. Intraoperative view just after pancreaticoduodenectomy (PD). Dilated and prominent gastroduodenal artery (GDA) and anterior pancreaticoduodenal arcade (APDA) were preserved during resection

identify discernable collaterals in the pancreatic head region, and there was no distant metastasis. During the operation, it was confirmed that gastroduodenal artery and anterior pancreaticoduodenal arcade (APDA) were clearly dilated. When the gastroduodenal artery was temporarily occluded, hepatic arterial blood flow ceased completely. PD was performed with the preservation of the gastroduodenal artery and APDA [Figure 3]. The diameters of the vessels were measured as 7 mm (normal ≤ 4.6 mm^[2]) and 6 mm (normal ≤ 3 mm^[3]), respectively. Postoperatively, aspartate and alanine aminotransferases were increased up to 1,685 IU/L and 1,375 IU/L, respectively. Serum bilirubin and prothrombin time were in the normal range.

Angiographic examination confirmed CA stenosis, and retrograde arterial flow from the SMA to the liver through APDA and the gastroduodenal artery [Figure 4]. No further angiographic intervention was required as retrograde blood flow was sufficient. Serum aminotransferases returned to normal range within 7 days, supporting the transient vasospasm of the surgically protected vessels causing hypoxic liver injury. Histopathological examination of the surgical specimen revealed pancreatic ductal adenocarcinoma.

DISCUSSION

The celiac axis and the SMA supply almost all of the blood flow to the upper gut viscera. Retrograde collateral blood flow through APDA and the gastroduodenal artery provide an effective blood

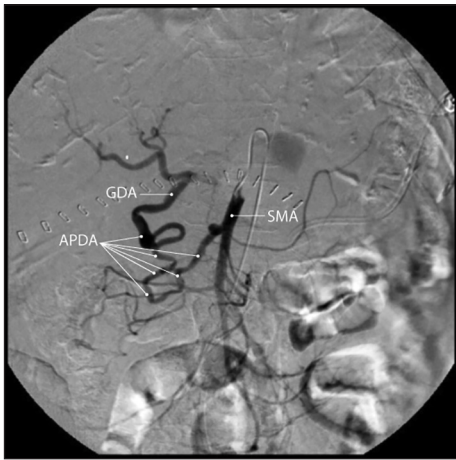


Figure 4. Postoperative angiographic image of the patient's gastroduodenal artery (GDA) and anterior pancreaticoduodenal arcade (APDA); Superior mesenteric artery (SMA)

supply when CA is stenosed or occluded slowly. Under normal circumstances, many of these collateral vessels might not be visible even on angiography, but these collaterals have the potential to increase in size in response to chronic ischemia [Figure 1]. If a prominent and thickened gastroduodenal artery is detected during EUS, CA stenosis should be investigated. To the best of our knowledge, significance of a prominent gastroduodenal artery detected by EUS as a sign of CA stenosis has not been reported in medical literature in English.

To avoid ischemic complications, preoperative stenting of the CA or intraoperative preservation of the collaterals or vascular reconstruction/bypass is needed, as most of these collaterals are ligated and cut during PD.^[4] Gastroduodenal artery preserving PD has the advantage of maintaining blood supply without the need for revascularization by maintaining retrograde collateral flow from the SMA.

Contrast-enhanced multidetector CT (MDCT) is the standard examination method for the detection of pancreatic tumors, and for the evaluation of resectability.^[5] Although, CA stenosis itself or collaterals in the pancreatic head region can be identified by CT, in a recent study, the sensitivity of MDCT without arterial reconstruction to detect CA stenosis was reported as 58%.^[6] Beside the usefulness of EUS for the identification of small tumors that have gone undetected by other imaging modalities, a good working knowledge of vascular anatomy during EUS examination can identify vascular diseases that can optimize patient management, and guide perioperative decisionmaking.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

REFERENCES

1. Song SY, Chung JW, Kwon JW, *et al.* Collateral pathways in patients with celiac axis stenosis: Angiographic-spiral CT correlation. *Radiographics* 2002;22:881-93.
2. Silveira LA, Silveira FB, Fazan VP. Arterial diameter of the celiac trunk and its branches. Anatomical study. *Acta Cir Bras* 2009;24:43-7.
3. Bertelli E, Di Gregorio F, Bertelli L, *et al.* The arterial blood supply of the pancreas: A review. I. The superior pancreaticoduodenal and the anterior superior pancreaticoduodenal arteries. An anatomical and radiological study. *Surg Radiol Anat* 1995;17:97-106, 1-3.
4. Sakorafas GH, Sarr MG, Peros G. Celiac artery stenosis: An underappreciated and unpleasant surprise in patients undergoing pancreaticoduodenectomy. *J Am Coll Surg* 2008;206:349-56.
5. Bockhorn M, Uzunoglu FG, Adham M, *et al.*; International Study Group of Pancreatic Surgery. Borderline resectable pancreatic cancer: A consensus statement by the International Study Group of Pancreatic Surgery (ISGPS). *Surgery* 2014;155:977-88.
6. Yang F, Di Y, Li J, *et al.* Accuracy of routine multidetector computed tomography to identify arterial variants in patients scheduled for pancreaticoduodenectomy. *World J Gastroenterol* 2015;21:969-76.