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Inferior pancreaticoduodenal artery aneurysm associated with celiac artery occlusion diagnosed by multidetector computed tomographic angiography

Çok kesitli bilgisayarlı tomografik anjiyografi ile tanı alan çöliyak arter oklüzyonu ile birliktelik gösteren inferior pankreatikoduodenal arter anevrizması

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Summary

Aneurysms of the visceral arteries are uncommon and represent 0.1 to 0.2% of all vessel aneurysms. With only 2% of all visceral arterial aneurysms, aneurysms of the pancreaticoduodenal arteries are a rarity. False aneurysms of the pancreaticoduodenal arteries are the result of pancreatitis or trauma, whereas atherosclerosis, fibromuscular dysplasia and connective tissue disorders are the main causes of true aneurysms. Aneurysm of the inferior pancreaticoduodenal artery associated with occlusion of the celiac artery is a rare event, but the risk of rupture and the high mortality rate seen in this setting require early diagnosis and prompt management. An accurate diagnosis of this uncommon condition can be easily and reliably made by multidetector computed tomographic angiography. Multidetector computed tomographic angiography enables high quality three-dimensional reconstructed images and allows noninvasive determination of the exact location and the size of the aneurysm. In this report, we present multidetector computed tomographic angiography findings of the inferior pancreaticoduodenal artery aneurysm associated with celiac artery occlusion.

Key Words: Angiography, celiac artery occlusion, Inferior pancreaticoduodenal artery aneurysm, multidetector computed tomography, visceral aneurysms.

Özet

Visseral arter anevrizmaları yaygın değildir ve tüm damar anevrizmalarının %0.1-0.2'sini oluşturur. Tüm visseral arter anevrizmalarının yalnızca %2'sini oluşturan pankreatikoduodenal arter anevrizmaları nadir görülürler. Pankreatikoduodenal arterlerin yalancı anevrizmaları pankreatit veya travmanın sonucu iken, ateroskleroz, fibromüsküler displazi ve konnektif doku hastalıkları gerçek anevrizmaların başlıca nedenleridir. Çöliyak arter oklüzyonu ile birliktelik gösteren inferior pankreatikoduodenal arter anevrizması nadir bir durumdur ancak rüptür riski ve bu durumda görülen yüksek mortalite oranı nedeniyle erken tanı ve acil tedavi gerektirir. Bu nadir durumun doğru tanısı çok kesitli bilgisayarlı tomografik anjiyografi ile kolaylıkla ve güvenilir bir şekilde konulabilir. Çok kesitli bilgisayarlı tomografik anjiyografi yüksek kaliteli üç boyutlu görüntüler sağlama olanağı verir ve anevrizmanın kesin lokalizasyonu ve boyutunun non-invaziv olarak belirlenmesine izin verir. Biz bu raporda çöliyak arter oklüzyonu ile birliktelik gösteren inferior pankreatikoduodenal arter anevrizmasının çok kesitli bilgisayarlı tomografik anjiyografi bulgularını sunuyoruz.

Anahtar Sözcükler: *Anjiyografi, çöliyak arter oklüzyonu, Inferior pankreatikoduodenal arter anevrizması, çok kesitli bilgisayarlı tomografi, visseral anevrizmalar.*

Introduction

Aneurysms of the visceral arteries are uncommon and represent 0.1 to 0.2% of all vessel aneurysms. With only 2% of all visceral arterial aneurysms, aneurysms of the pancreaticoduodenal arteries are a rarity (1).

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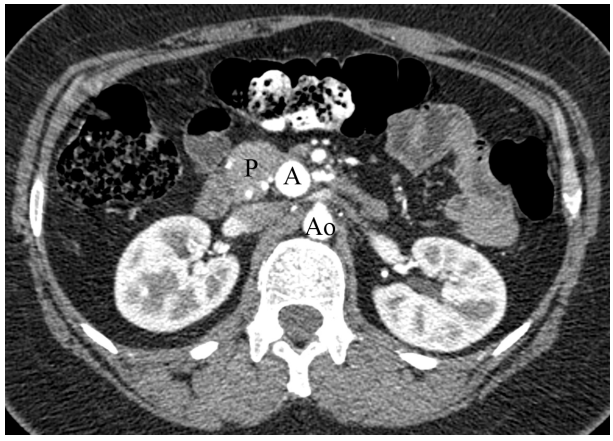
False aneurysms of the pancreaticoduodenal arteries are the result of pancreatitis or trauma, whereas atherosclerosis, fibromuscular dysplasia and connective tissue disorders are the main causes of true aneurysms (2). An association between the pancreaticoduodenal artery aneurysm and celiac artery stenosis or occlusion due to atherosclerosis or median arcuate ligament

syndrome has also been reported (3-6). Of the reported cases with pancreaticoduodenal artery aneurysms, 65% were diagnosed upon rupture; the mortality rate in these patients was about 50% caused by fatal bleeding in the retroperitoneum, peritoneal cavity, or into the gastrointestinal tract (7,8). Thereby, to improve the prognosis of patients with these aneurysms, early detection before rupture and effective treatment are necessary. Multidetector computed tomographic (MDCT) angiography has emerged as an essential imaging technique in the evaluation of the abdominal vascular structures because it is noninvasive, safe, fast and informative, permitting small branches to be assessed reliably due to high spatial resolution (9,10). The diagnosis of visceral artery aneurysms can easily be made with MDCT angiography, which is also useful as an anatomic reference because of its three-dimensional capability (9). In this report, we present a case of inferior pancreaticoduodenal artery aneurysm associated with celiac axis occlusion diagnosed by MDCT angiography.

Case Report

A-32-year-old woman with previous history of two episodes of acute pancreatitis presented with an abdominal pain. Physical examination showed epigastric pain on palpation. Abdominal ultrasound showed an anechoic lesion close to the head of the pancreas, which was suspected of being a visceral artery aneurysm. Cholelithiasis and hepatosteatosis were also present. MDCT angiography was performed using a 16-row MDCT (Lightspeed Ultra, General Electrical Medical Systems, Milwaukee, Wisc.; USA). Imaging parameters were as follows: 16x1.25 mm collimation, 120 kV, 400 mA, table feed 11.2 mm/sec, gantry rotation 500 msec. After determining the contrast agent transit time using the bolus tracking technique, we acquired image data during an intravenous injection of 120 ml of iodinated contrast agent (Iodixanol, Visipaque 320 mgI/ml, GE Healthcare, Milwaukee, Wisc.; USA) at a rate of 4 ml/sec. For three-dimensional image reconstruction, the raw CT data were processed on a separate workstation (Advanced Workstation 4.2, GE Healthcare, Milwaukee, Wisc.; USA). MDCT angiography revealed enlarged pancreaticoduodenal arcade and an aneurysm of the inferior pancreaticoduodenal artery 16x20 mm in diameter. (Figure 1, 2) Occlusion of the celiac axis due to compression of the its origin by median arcuate ligament of the diaphragm was suggested. (Figure 2b)

In addition, the left hepatic artery directly originating from the common hepatic artery and the posterior superior pancreaticoduodenal artery arising from the proper hepatic artery was also noted. Because of celiac trunk occlusion, surgical management was preferred. Resection of the inferior pancreaticoduodenal artery aneurysm with consecutive reconstruction of the inferior pancreaticoduodenal artery by end-to-end anastomosis and division of the median arcuate ligament of the diaphragm was performed. However, vascular reconstruction of celiac axis occlusion was not performed to avoid increased operative risk. Additional cholecystectomy was performed because of cholelithiasis. The pathologic examination of aneurysm was compatible with a true aneurysm.



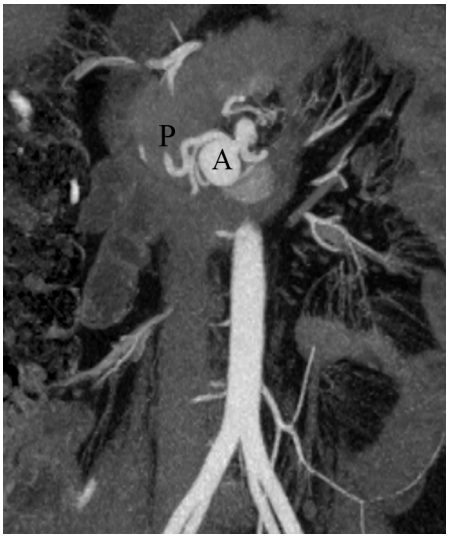
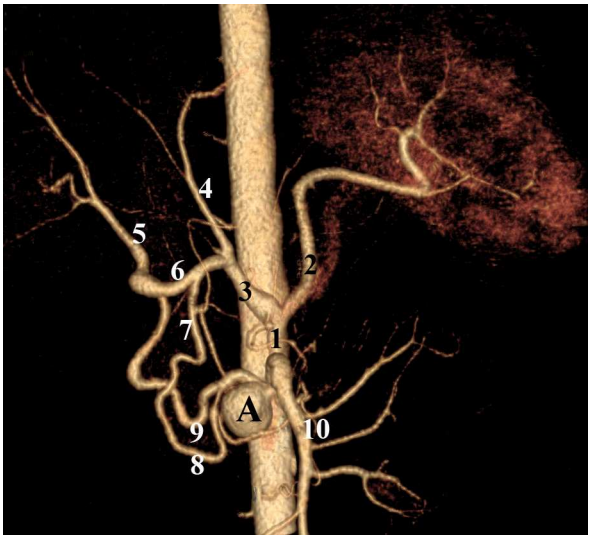


Figure 1. Axial **(a)** and coronal maximum intensity projection **(b)** images show an aneurysm (A) near the head of the pancreas (P), (Ao=aorta).



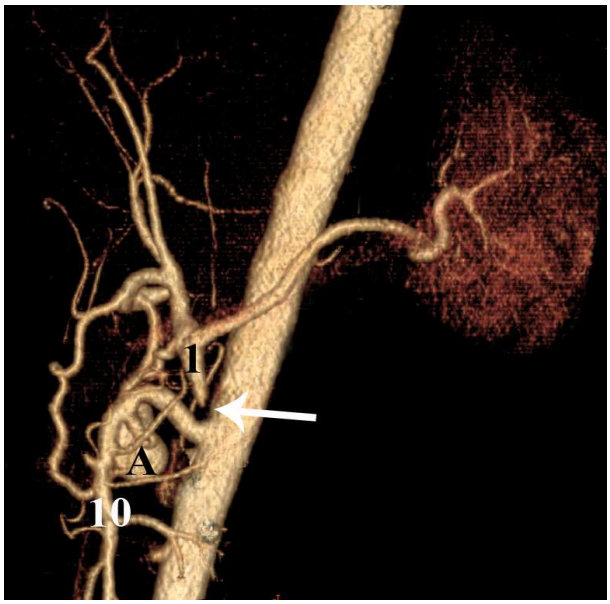


Figure 2. Anterior volume rendering image **(a)** shows an aneurysm (A) of the inferior pancreaticoduodenal artery. Left lateral volume rendering image **(b)** shows occlusion of the celiac axis (arrow). The left hepatic artery directly originating from the common hepatic artery and the posterior superior pancreaticoduodenal artery arising from the proper hepatic artery are also present (1=celiac axis, 2=splenic artery, 3=common hepatic artery, 4=left hepatic artery, 5=right hepatic artery, 6=proper hepatic artery, 7=gastroduodenal artery, 8=anterior superior pancreaticoduodenal artery, 9= posterior superior pancreaticoduodenal artery, 10=superior mesenteric artery).

Discussion

Visceral artery aneurysms can be divided into false and true aneurysms. False aneurysms are often seen as a complication of pancreatitis. Leakage of pancreatic enzymes damages the surrounding tissue including the gastroduodenal artery and the pancreaticoduodenal artery. Additional causes of false aneurysms include iatrogenic causes, trauma, septic emboli and ruptures of the gastrointestinal tract (2). The development of true aneurysms of the pancreaticoduodenal artery is mostly explained by a hemodynamic theory first proposed by Sutton and Lawton in 1973 (3). The authors stated that the association of celiac axis stenosis or occlusion and pancreaticoduodenal artery aneurysms is not coincidental. With the stenosis or occlusison of the celiac axis liver, spleen and stomach is supplied by the superior mesenteric artery via the collateral pathway from the pancreaticoduodenal arcades. The chronic increase of blood flow through pancreaticoduodenal arteries weakens the arterial wall, causing dilatation that leads to true aneurysm formation. The aneurysms may be small or large and in a few cases, multiple (11). The inferior pancreaticoduodenal artery aneurysms may be associated with aneurysms of the dorsal pancreatic artery or other collateral vessels (12).

Aneurysms of the inferior pancreaticoduodenal artery produce a variety of clinical manifestations, ranging from vague abdominal symptoms to hemorrhagic collapse (7). The patients may be asymptomatic and the aneurysms may be incidentally detected on ultrasound or CT examination. A few patients may present with symptoms of mesenteric ischemia such as abdominal pain due to coexistent mesenteric arterial stenosis. Others may present with signs and symptoms of ruptured aneurysms, including hypotension, gastrointestinal bleeding, acute abdominal pain or jaundice. These aneurysms usually rupture into the retroperitoneal space around the pancreas. More rarely, if treatment is delayed the aneurysm may ultimately rupture into peritoneal cavity or, exceptionally, into the digestive tract, the duodenum, or Wirsung canal (5,7,12). No definite relationship between aneurysm rupture and the size has been reported and it is difficult to predict the aneurysm rupture only based on only the aneurysmal diameter (7,12).

Conventional catheter angiography is one of the best ways to diagnose and localize visceral artery aneurysms, allowing dynamic evaluation of collateral blood flow in cases of obstruction of major splanchnic arteries (13). However, though usually considered safe, it may be associated with complications that result from its invasive nature, with a complication rate of up to 1%

(14). Recently, MDCT angiography has become a useful tool in the evaluation of the abdominal vascular structures. MDCT scanners have provided shorter image acquisition time, narrower collimation, improved temporal and spatial resolution, decreased motion and partial volume artifacts and near isotropic data acquisition compared with single-detector spiral CT. MDCT is particularly useful for angiographic applications because they provide larger anatomic coverage, increased contrast enhancement of the arteries, and higher longitudinal spatial resolution (9,10). Two- and three-dimensional images provide better definition and better display of the anatomy and course of the vessels, which resembles traditional arteriograms and provides the surgeon with a three-dimensional model of the patient's arterial anatomy.

Because of poor diagnosis after rupture, treatment of pancreaticoduodenal artery aneurysms is mandatory even for asymptomatic patients. The surgical management of pancreaticoduodenal artery aneurysms includes ligation and resection of the aneurysm with concominant revascularization procedures (4). Another treatment of these aneurysms is transcatheter arterial embolization; this procedure has been successful in some reports (13,15,16), but the risk of complications such as bowel ischemia and aneurysm rupture is present (5). Hildebrand et al. suggested that in patients with pancreaticoduodenal artery aneurysms in asscociation with celiac trunk occlusion, surgical therapy should be performed because of the possible necessity of intraoperative vascular reconstruction due to poor collateral circulation causing decreased blood perfusion (4). So, we preferred surgical therapy to avoid ischemic complications. Concurrent treatment of celiac axis stenosis or occlusion including direct revascularization of the celiac trunk (thromboendarterectomy with patch graft, continuity resection with an interposition graft, or reanastomosis and reimplantation of the artery) or bypass operations, during the management of pancreaticoduodenal artery aneurysms has been recommended by a few authors (17). However, no recurrence of pancreaticoduodenal artery aneurysms even in association with stenosis or occlusison of the celiac trunk is described after simple ligation or embolization. Current opinion in this issue is that an additional repair of celiac axis occlusion is unnecessary due to increased operative risk (4,12). In our case, we performed resection of the inferior pancreaticoduodenal artery aneurysm with consecutive revascularization of the artery by end-to-end anastomosis but we did not perform an additional reconstruction of celiac axis occlusion.

In conclusion, aneurysms of the inferior pancreaticoduodenal artery associated with occlusion of the celiac axis is a rare event, but the risk of rupture and the high mortality rate seen in this setting require early diagnosis and prompt management. Diagnosis of this uncommon condition is easily and consistently made by MDCT angiography. It enables high quality three-dimensional reconstructed images and allows noninvasive determination of the exact location and the size of the aneurysm. We suggest that MDCT angiography be considered as the primary study in the setting of suspected a visceral artery aneurysm.

Kaynaklar

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