Introduction

Aneurysm of the pancreaticoduodenal arcade is an uncommon condition. The incidence is about 2% of all visceral arterial aneurysms (VAAs). The causes are multiples and sometimes difficult to identify. They are often associated with trauma, pancreatic and biliary surgery, pancreatitis, infection, and less commonly with vasculitis. Such aneurysms are considered as a pseudoaneurysm.[1] True aneurysm of the pancreaticoduodenal arcades (IPDA) may be associated with celiac axis lesions secondary to atherosclerosis or median arcuate ligament compression. This association was first described by Sutton.[2] Usually asymptomatic, these aneurysms are often detected incidentally, but in 30% of cases, symptoms are present commonly associated with rupture signs.[1,2] The risk of rupture increases when the diameter of aneurysm reaches 2 cm and is associated with high mortality rate (40%–60%).[3] Contrast-enhanced multislice computed tomography (CT) and selective angiography are very useful in preoperative evaluation. Because surgery might be difficult due to the hazardous anatomy, endovascular approach seems to be a good choice. Endovascular treatment tends to isolate and exclude the aneurysm by embolization of the aneurysmal neck using coils. We report the case of a 48-year-old patient presenting an asymptomatic aneurysm of the IPDA of 24 mm diameter, associated with a celiac axis stenosis. The patient was treated by endovascular approach (packing with coils and stenting) with a perioperative aneurysmal occlusion.

Case Report

A 48-year-old patient went to the emergency department for persistent abdominal pain without any digestive symptoms, hyperthermia, or chills. Abdominal clinical examination revealed pain in the left lumbar region without any defense, rebound, or signs of peritonism. His medical history only included a left nephritic colic. Blood tests showed leukocytosis 11,900/mm³ (78% granulocytes) and a slight enhancement of renal function (modification of diet in renal disease 54 ml/min, creatinine 1.4 mg/dl). CT-uro-scan confirmed left ureteral locked calculi of 7.4 mm with pyelo-ureteral fistula.

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dilatation. An asymptomatic VAA of more than 2 cm located close to the superior mesenteric artery (SMA) was detected. The patient was treated by ureteral catheter and extracorporeal lithotripsy. Few months later, he was sent to the vascular surgery department to treat the SMA aneurysm. Contrast-enhanced multislice CT with reconstruction permits to describe anatomical pitfalls and morphology of the lesion. The aneurysm was located at the IPD arcade close to the SMA with a short afferent neck (4 mm) and measure 24 mm in the longest axis. An endovascular approach was proposed. The goals of the intervention were double: to exclude the aneurysm and to avoid IPDA occlusion or visceral ischemia. Percutaneous right femoral artery access was employed using a 6 Fr Sheath (Cordis, Johnson and Johnson Company, USA). Then, we performed a celiomesenteric aortography with a 4 Fr Pigtail Catheter (Terumo Medical Corporation, Japan). Selective angiography of the SMA (4 Fr Simmonds/Sidewinder Catheter, Terumo Medical Corporation, Japan) allowed us to identify the short afferent neck (4 mm) arising directly from the proximal segment of the SMA [Figure 1]. The efferent neck flowed to the hypertrophic IPD arcade referring to a celiac axis stenosis. We catheterized the distal neck of the IPD arcade with a 5 Fr Catheter (Terumo Medical Corporation, Japan) to deploy an 8 mm diameter coil (Cook Medical, USA) to close it. Then, packing of aneurysmal sac was performed with 8 mm (×3) and 5 mm (×8) coils to occlude it. Finally, a 6–8 × 30, self-expandable stent (Acculink Carotid System, Abbott Vascular, USA) was placed into the proximal SMA covering the afferent neck. Postprocedure angiography showed an occlusion of the aneurysm sac and patency of the IPD arcade and SMA [Figure 1]. The postoperative and biological course was satisfying, and the patient was discharged after 1 day with an antiplatelet treatment (acetylsalicylic acid 80 mg/day). After 6-month follow-up, the patient remains asymptomatic. Multislice CT-scan with contrast confirms occlusion of the aneurysm. SMA and IPD arcade remains patents [Figure 2].

**DISCUSSION**

VAA are relatively rare entity. The incidence is estimated between 0.1% and 2% of all the aneurysms. The splenic artery is the most commonly affected artery (60%), followed by hepatic (20%) and SMA (5.5%). IPDA aneurysms are extremely rare and represent only 1.5%–2% of the VAA. The first case of a pancreaticoduodenal artery aneurysm was reported in 1895 by Ferguson. Conventional etiologies are atherosclerosis, abdominal trauma, mycotic, pancreatitis, duodenal ulcer, pancreatic and biliary surgery, and vasculitis. These are considered as pseudoaneurysm secondary to inflammation, infection, or trauma. On the other hand, true IPD aneurysms are often associated with celiac axis stenosis or occlusion. This association was first described by Sutton and Lawton in 1973 and later by Kadir. Celiac axis stenosis may be secondary to atherosclerosis or compression by median arcuate ligament. In 1999, de Perrot reported a series of 52 IPDA cases. Aneurysms associated with celiac trunk lesions represented more than 60% of cases. Stenosis of celiac trunk increases retrograde blood flow in the IPD arcade that induces arterial enlargement and parietal changings, then promoting the development of aneurysm as described by Kallamadi et al. Asymptomatic IPDA aneurysm are usually diagnosed incidentally during abdominal ultrasound, CT-scan, or magnetic resonance imaging (MRI), but in 30% of cases, symptoms are present. The most frequent symptoms are abdominal pain, gastrointestinal bleeding, hemobilia, melena, obstructive jaundice, pancreatitis, or mesenteric ischemia when SMA becomes thrombosed. The risk of rupture of this type of aneurysms varies between 38% and 50% with high mortality rate (between 40% and 60%). Kallamadi et al. considered the risk unrelated to the size but ruptured IPDA are usually ranged between 0.6 and 2 cm. Diagnosis can be done with abdominal ultrasound, CT-scan, or MRI, but selective angiography remains the gold standard to evaluate preoperative therapy. Treatment indications include aneurysmal diameter >2 cm, rapid growth of the aneurysm,
symptomatic and mycotic aneurysms, pseudoaneurysms, reproductive-aged women, and transplanted patients.\(^1\) Many options exist to treat these particular lesions. Due to the location of these aneurysms, surgical approach seems to be challenging even in asymptomatic patients.\(^2\) Endovascular approach might be an attractive alternative because it is less invasive than surgery and it can be safely performed with minimal complications.\(^2\) The most commonly employed methods are stent graft, embolization with coils or cyanoacrylate glue, and flow diversion stent.\(^3\) The choice of the method depends on the size, etiology, clinics, and location of the aneurysm.\(^2\) The basic endovascular procedure tries to isolate and exclude the afferent and efferent neck of the aneurysm using coils. If not possible, packing (with coils) could be performed. When endovascular approach failed, surgical treatment is recommended.\(^8\)

In this case, the aneurysm was located in the IPDA close to the SMA. The short afferent neck (only 4 mm) makes embolization option very dangerous. The hypertrophic retrograde flow of the IPD arcade is the sign of celiac axis stenosis [Figure 3]. The efferent neck was embolized with 8 mm coils and the aneurysmal sac packed by 8 mm (×3) and 5 mm (×8) coils inducing the occlusion. The afferent neck was excluded by self-expandable stent of the proximal SMA (Acculink Carotid System, Abbott Vascular, USA). Perioperative angiography confirmed occlusion of the aneurysmal sac [Figure 3]. The etiology of this aneurysm remains uncertain. Medical history excluded classic etiologies of pseudoaneurysm such as mycotic, inflammatory, or traumatic diseases. True aneurysm seems to be confirmed by the multislice CT-scan reconstruction showing a hypertrophic IPD arcade associated with a celiac trunk stenosis. The absence of atherosclerosis lesions evokes a median arcuate ligament compression [Figure 2]. Associated treatment of the celiac axis trunk lesions remains controversial. It is possible that treatment of celiac stenosis may decrease recurrence of this kind of aneurysms.\(^2\) Grown evidence of the IPDA has never been described in the literature after embolization.\(^1\) However, many authors recommend to treat celiac axis stenosis if atheromatous lesion is present, usually by percutaneous angioplasty and stenting.\(^2\) In case of median arcuate ligament compression, laparoscopic section could be proposed. Recently, several authors described a self-expandable stenting compression even for median arcuate ligament compression associated with IPDA aneurysm embolization with good results, but there is no consensus regarding this therapeutic choice.\(^8\)

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**Conflicts of interest**

There are no conflicts of interest.

**REFERENCES**

1. Kallamadi R, Demoya MA, Kalva SP. Inferior pancreaticoduodenal artery aneurysms in association with celiac stenosis/occlusion. Semin Intervent Radiol 2009;26:215-23.
2. Kalva SP, Athanasoulis CA, Greenfield AJ, Fan CM, Curvelo M, Waltman AC, et al. Inferior pancreaticoduodenal artery aneurysms in association with celiac axis stenosis or occlusion. Eur J Vasc Endovasc Surg 2007;33:670-5.
3. Ferrero E, Ferri M, Viazzo A, Robaldo A, Carbonatto P, Pecchio A, et al. Visceral artery aneurysms, an experience on 32 cases in a single center: Treatment from surgery to multilayer stent. Ann Vasc Surg 2011;25:923-35.
4. Ducasse E, Roy F, Chevalier J, Massouille D, Smith M, Speziale F, et al. Aneurysm of the pancreaticoduodenal arteries with a celiac trunk lesion: Current management. J Vasc Surg 2004;39:906-11.
5. Balderi A, Antonietti A, Pedrazzini F, Sortino D, Vinay C, Grosso M. Treatment of visceral aneurysm using multilayer stent: Two-year follow-up results in five consecutive patients. Cardiovasc Intervent Radiol 2013;36:1256-61.
6. Messina F, Azzena G, Anania R, Galeotti R, Pelligrini D, Cavallesco G. Pancreaticoduodenal artery aneurysm ruptured into duodenum, associated with celiac trunk stenosis. Case report and review of the literature. EJVES Extra 2006;12:15-8.
7. Pulli R, Dorigo W, Troisi N, Pratesi G, Innocenti AA, Pratesi C. Surgical treatment of visceral artery aneurysms: A 25-year experience. J Vasc Surg 2008;48:334-42.
8. Murata S, Tajima H, Fukunaga T, Abe Y, Niggemann P, Onozawa S, et al. Management of pancreaticoduodenal artery aneurysms: Results of superselective transcatheter embolization. AJR Am J Roentgenol 2006;187:W290-8.
9. Jiang J, Ding X, Su Q, Zhang G, Wang Q, Jian W, et al. Therapeutic management of superior mesenteric artery aneurysms. J Vasc Surg 2011;53:1619-24.
10. Ikeda O, Nakasone Y, Yokoyama K, Inoue S, Tanura Y, Yamashita Y. Simultaneous coil embolization and angioplasty using a self-expanding nitinol stent to treat pancreaticoduodenal artery aneurysms associated with celiac axis stenosis. Acta Radiol 2013;54:949-53.

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**Figure 3:** Per-operative angiography showing a short afferent neck and hypertrophy of the IPD arcade.