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Visceral Artery Pseudoaneurysm Involving Celiac Artery Secondary to Endovascular Stent Fracture

ABSTRACT

Visceral artery pseudoaneurysm are rare potentially fatal lesions. They occur due to weakening of vessel wall secondary to trauma, iatrogenic events, infections, inflammation, and atherosclerosis and carry a high risk of rupture leading to life threatening hemorrhage. Surgical and endovascular treatment options including embolization of the pseudoaneurysm or exclusion of the aneurysm with a stent-graft are available for the management of these pseudoaneurysms. In this case report, we report complications of celiac artery stent fracture with resultant pseudoaneurysm that was successfully treated with endovascular coil embolization.

Key words: Celiac artery pseudoaneurysm, Endovascular intervention, Stent fracture

INTRODUCTION

Abdominal visceral artery pseudoaneurysms are potentially fatal lesions arising from splanchnic circulation, necessitating urgent intervention due to the risk of fatal hemorrhage. The commonly involved visceral arteries are the splenic, followed by the hepatic artery, with rare involvement of the celiac artery. Visceral artery pseudoaneurysms develop due to disruption of intimal and medial layers of the arterial wall and hence unlike true aneurysms, do not contain any epithelized wall increasing the risk of rupture. Hence nearly all pseudoaneurysms require treatment.

In our case, the celiac artery pseudoaneurysm was secondary to a fracture of the endovascular stent inserted for celiac artery stenosis with resultant mesenteric ischemia. The exact etiology of the stent fracture is not known. The fractured fragments of the stent resulting in vessel wall trauma and loss of vessel integrity leading to pseudoaneurysm formation. Various approaches are available for the management of visceral artery pseudoaneurysms, including endovascular, percutaneous, and endoscopic. Endovascular approach is the most widely used and preferred method and involves embolization and/or exclusion with a stent graft.[1,2]

It is associated with higher success rates and lesser postoperative complications than open surgical repair.[3] Percutaneous or endoscopic techniques are usually reserved for failed endovascular approaches.

CASE REPORT

A 48-year-old man with a history of smoking, hypertension, and prior coronary angioplasty presented with postprandial abdominal pain and vomiting. A clinical diagnosis of mesenteric ischemia was made. Computed tomography angiography of the abdomen and pelvis and subsequent digital subtraction angiography (DSA) revealed a short segment occlusion of the celiac artery and a chronic long segment occlusion of the proximal superior mesenteric artery (SMA) with the absent antegrade flow but the retrograde filling of the distal SMA via collaterals. There was a short segment occlusion at the origin of the inferior mesenteric artery. Given the clinical symptoms, the patient underwent endovascular stenting of the celiac artery using a 6 mm × 18 mm balloon expandable stent (Viatrac). The inferior mesenteric artery was also treated with a balloon expandable stent of 7 mm × 8 mm (Viatrac). Patient tolerated the procedure well with no immediate post-procedure complications. On follow-up CT at 2 years, in-stent thrombosis at the proximal end of the celiac artery stent was noted [Figure 1]. This was thought to be due to in-stent endothelial hyperplasia. As the distal flow was well maintained and the patient remained asymptomatic, he was advised to continue dual antiplatelet anticoagulation medication (aspirin 150 mg and clopidogrel 75 mg OD).

He presented with recurrent dull aching abdominal pain a year later. CT revealed a fracture of the stent in the celiac

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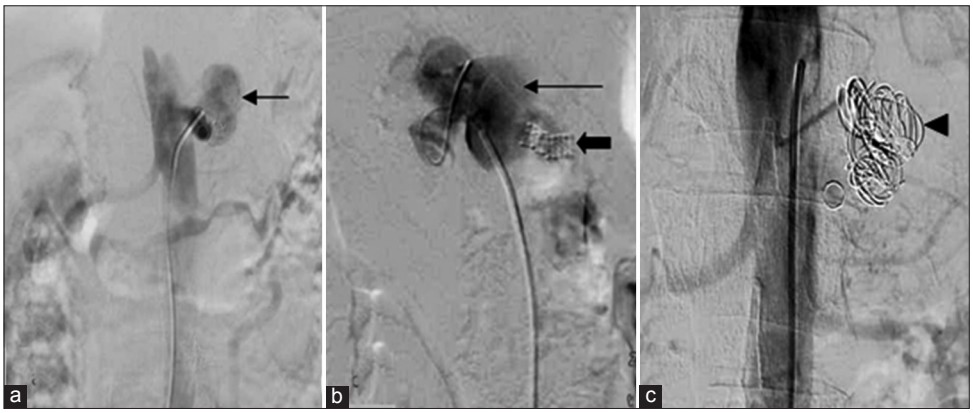
Figure 1: Axial image of CECT abdomen in the arterial phase showing stent *in-situ* (white arrow) with absent opacification of proximal segment of the celiac artery suggestive of in-stent thrombosis (thin black arrow). Celiac artery distal to the stent and its branches show normal opacification suggestive of reformation secondary to collateralisation(block arrows)

Figure 2: Axial image of CECT abdomen showing complete displaced stent fracture (thin arrows) with a large periarterial hematoma consistent with pseudoaneurysm of the celiac artery (block arrow). Distal segment of the celiac artery and its branches show normal opacification

artery with consequent celiac artery pseudoaneurysm and periarterial organized hematoma [Figure 2]. There was a complete disruption of the celiac artery stent with the left lateral displacement of a fractured proximal fragment. The distal fragment was seen in the distal portion of the celiac artery. DSA revealed absent antegrade flow in the celiac artery branches distal to the stent. There was the retrograde filling of the celiac artery branches through the pancreaticoduodenal arcade. The contrast material opacified up to the distal end of the fractured stent and the pseudoaneurysm at the origin of the celiac artery. The stent in the inferior mesenteric artery was patent with good antegrade flow. The patient was taken up for endovascular management. The celiac artery catheterized with a 5F catheter and a microcatheter (Progreat, Terumo, New Jersey, USA) was navigated across the neck of the pseudoaneurysm and selective embolization of the pseudoaneurysm and occlusion of the diseased segment of the parent artery was performed using platinum-based detachable coils coated with nylon and PGLA (Concerto, Medtronics, Minnesota, USA) [Figure 3a and b]. Post-procedural angiogram revealed complete exclusion of the pseudoaneurysm from the circulation [Figure 3c]. The patient remained hemodynamically stable with no immediate post-procedural complications. Further follow-up could not be obtained as the patient succumbed to cardiovascular complications with sudden cardiac arrest 3 weeks later.

DISCUSSION

This case aims to highlight the rare complication of stent fracture with pseudoaneurysm formation following the endovascular treatment of visceral arterial stenosis. The exact mechanism of stent fracture with resultant arterial damage and pseudoaneurysm formation remains unclear. However, respiratory movements causing diaphragmatic compression of the celiac artery can result in stent fatigue and fracture. Predisposing factors include vessel tortuosity, ostial stenosis, calcified lesions, increased angulation of the lesion, and mechanical fatigue.[4,5] Procedure-related factors such as stent overlap and excessive stretching of stents under high pressure and high balloon inflation pressure can also result in stent fractures.[6] Stent design also contributes to stent fractures with the greater incidence among stents of closed cell design due to greater rigidity.[7] Stent fractures are classified into 4-types based on the classification system proposed by Mohsen *et al*.[8] Classification of stent fractures is based on strut disruption into the following types: Type I - single-strut fracture or gap between struts >2 times normal; Type II Multiple strut fractures with V-type division of stent; Type III complete transverse fracture of the stent without displacement of 2 components of the fractured stent by 1 mm; Type IV complete transverse fracture of the stent with torsion or displacement of 2 stent fragments by >1 mm.[9] This patient had a type IV stent fracture-complete transverse fracture with stent displacement. The complications occurring due to a stent fracture include stent thrombosis, recurrence of symptoms, and stent-related arterial pseudoaneurysm. Emergency endovascular interventions have replaced surgical procedures for the treatment of pseudoaneurysms and have the advantage of low postoperative complications and less morbidity and mortality. Endovascular options include embolization using coils or glue (thrombin or cyanoacrylate). A stent-graft placement should be considered when the artery cannot be sacrificed. When endovascular management options fail or remain unfeasible, surgical intervention needs to be done.



Figures 3: (a-c) Digital subtraction angiography images showing pseduoaneurysm arising from the proximal aspect of celiac artery (thin arrow) which was coiled, with subsequent complete exclusion from the circulation (arrow head). Fractured stent with displaced fragments is noted in proximity to pseudoaneurysm (block arrow)

CONCLUSION

The combination of a stent fracture and resultant visceral artery pseudoaneurysm, albeit rare, is a life-threatening complication of endovascular stenting. The endovascular management is preferred as it offers optimally successful and instantaneously life-saving results in emergent situations. Further studies involving the underlying mechanism of stent fracture and targeted treatment strategies are warranted to avoid the long-term morbidity of stents.

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