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Endovascular Emergency Management of Hepatic Pseudoaneurism with Vascular Plug 4 System with Sacrifice of the Aneurism Nutrient Artery (Report of 2 Cases)

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Abstract

Pseudoaneurisms are arterial wounds that affect all layers of an artery; although very rare they are mostly lethal and most of them are iatrogenic. Herein, we present two different cases of hepatic artery pseudoaneurysms derived from previous surgeries which were assessed by computed tomography angiographies and consequent conservative endovascular approaches with arteriographies, posterior cannulations and the placement of Amplatzer Vascular Plug 4 (AVP 4) systems in order to treat the pseudoaneurysm. Computed control tomographies were conducted showing no later complications. The purpose of this article is to demonstrate the importance and current clinical applications of AVP in the field of interventional radiology.

Keywords

Endovascular, Hepatic Pseudoaneurysm, Interventional Radiology, Vascular Plug

1. Introduction

A pseudoaneurysm is an arterial wound characterized by a disruption through all the layers of an artery with the particularity of a continuous flow outside the vessel into a space contained by the surrounding tissue [1]. They may be classified as iatrogenic, infected, anastomotic, or (the most common) iatrogenic [1]

[2]. Hepatic artery pseudoaneurysm is a very rare and lethal entity and is considered an acute emergency which requires an immediate intervention, with an associated mortality of up to 50% [3] [4] [5] [6].

Its pathogenesis is not well established; however, it is common to have a direct wound due to instrumentation (which is continuously rising due to more common use of percutaneous and endoscopic hepatic interventions) or an indirect wound due to its association with acute cholecystitis or bile fugue [7].

Clinically, more than half of patients refer right upper quadrant abdominal pain which radiates to the back and almost a third present a classic triad of biliary colic, obstructive jaundice and haemobilia [8].

Past medical history as well as clinical suspicion of vascular wounds are an important part of the diagnosis, despite that, computed tomography angiography remains to be the gold standard in order to locate a vascular wound and assess its size and possible anatomical variants [9] [10].

The aim of this case report is to demonstrate that endovascular treatment with Amplatzer Vascular Plug 4 (AVP 4) systems in pseudoaneurysms, although not being the best treatment option, can be utilized as an alternative option in situations where there is no access to coils, nor microcoils for pseudoaneurysm exclusion.

2. Presentation of the First Case

2.1. Presentation and Investigations

54 years old patient with history of hypertension and morbid obesityis operated with a laparoscopic "Roux-en-Y" gastric bypass (LRYGB). Three days after original procedure starts complaining with dizziness, fatigue and light to moderate pain in right hypochondrium, showing anaemia with a 6 mg/dl haemoglobin concentration, haemobilia through T.-probe as well as clinical signs suggestive of hypovolemic shock such as tachycardia, tachypnea and weak arterial extremity pulses.

Due to prior surgical procedure, the clinical suspicion is oriented towards post-surgical complication, therefore, computed tomography angiography is conducted in order to examine the patient, demonstrating the presence of a hyperdense sacular image suggestive of hepatic pseudoaneurysm in the medial segment of the right hepatic artery (**Figure 1**).

2.2. Management

Coil embolization was considered, however due to not having available coils, conservative endovascular approach is decided: selective hepatic arteriography is conducted showing an opacification of the sacular pseudoaneurism (**Figure 2(a)**), cannulation of the hepatic artery and placement of vascular plug system was performed using an Amplatzer Vascular Plug 4 (**Figure 2(b)**), following the usual steps:

(a) (b)

Figure 1. (a). Computed Tomography Angiography in transverse plane, an hyperdense image with sacular morphology in right hepatic artery. (b). Volume reconstruction where a sacular dilation can be seen on the right hepatic artery on the same patient.

(a) (b)

Figure 2. (a). Common hepatic artery angiography where an opacification of the sacular aneurism can be observed. (b). Selective cannulation of the hepatic artery and vascular plug placement in the same patient.

The AVP4 model used was 9-AVP038-008 which has a vascular plug diameter of 8 mm and an unconstrained length of 13.5 mm. First, the loader was purged with sterile saline, the loader and delivery were removed from hoop dispenser, the delivery catheter was the the 0.038" Guidewire-Compatible Diagnostic Catheter 5F Dx Catheter.

The catheter was advanced until the distal tip of the catheter was near the occlusion site (corroborated with arteriography) in the aneurysm nutrient artery. The guidewire was removed, followed by the insertion of the tapered tip, the rotating luer was grasped and pressed to the hub and then rotated clockwise. The delivery wire was advanced and placed and then, the delivery catheter was retracted to deploy the device at the occlusion site. Position of the device was verified using the marker bands. Delivery catheter and wire were removed.

Outcome of procedure was positive and the patient progressively stabilized. Patient was discharged five days later with a 11 mg/dl haemoglobin concentration and no symptoms nor clinical signs. Patient was followed up with subsequent tomography controls at three and eight months after procedure (**Figure 3(a)**, **Figure 3(b)**).

3. Presentation of the Second Case

3.1. Presentation and Investigations

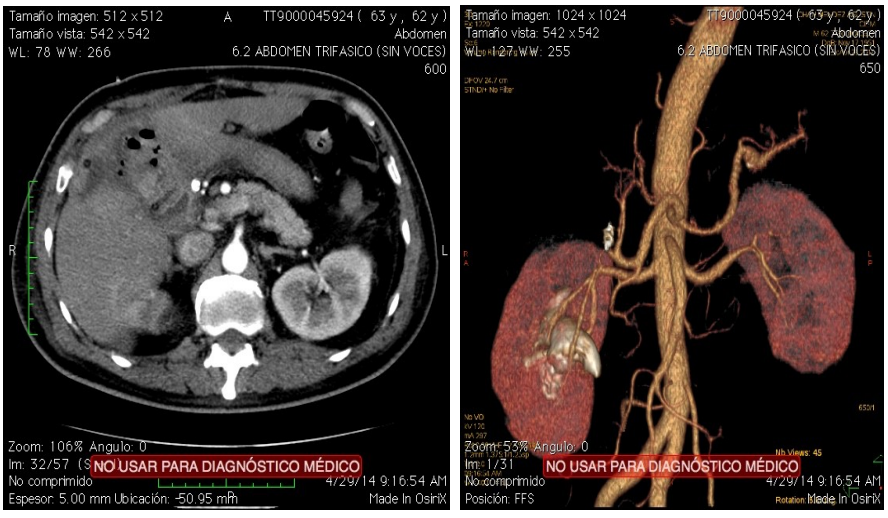
50 years old cholecystectomy post-operated patient with history of diabetes, grade I obesity and hypertension who presents important haemobilia, as well as jaundice, clinical data suggestive of hypovolemic shock such as shortness of breath and tachypnea.

Due to clinical data and the antecedent of cholecystectomy clinical suspicion is oriented towards operation-derived complication, we decide to perform an emergency angiotomography and the presence of pseudoaneurysm with haematoma is assessed (**Figure 4(a)**, **Figure 4(b)**).

3.2. Management

Coil embolization was considered, however due to not having available coils, conservative endovascular approach is decided, and an angiography is conducted followed by the placement of Amplatzer Vascular Plug 4 system, therefore decreasing flow in the right hepatic artery (**Figure 5**).

The AVP4 model used was 9-AVP038-007 which has a vascular plug diameter of 7 mm and an unconstrained length of 13.5 mm. First, the loader was purged with sterile saline; the loader and delivery were removed from hoop dispenser;



(a) (b)

Figure 3. (a). Control angiotomography in transverse plane in which there is no sign of opacification due to contrast on the right hepatic artery. (b). Volume reconstruction of the same case.

(a) (b)

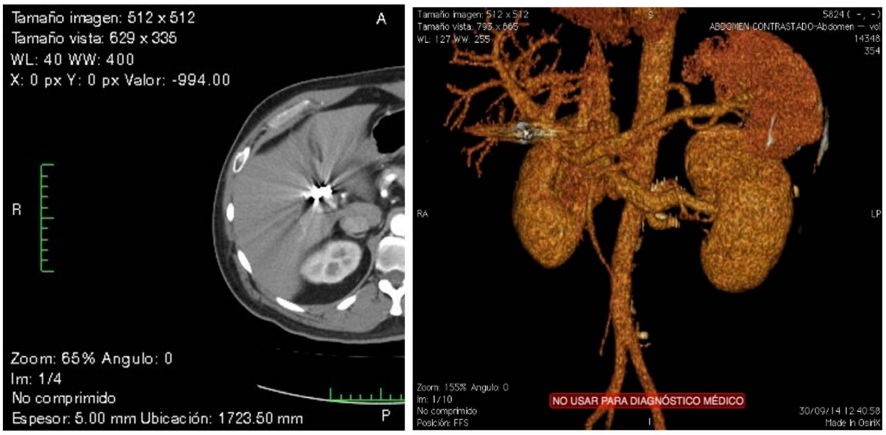
Figure 4. (a). Angiotomography shows a sagittal projection, with an image of pseudoaneurysm in right hepatic artery with a periwound haematoma. (b). Volume reconstruction of the same case.

Figure 5. Vascular plug placement on the right hepatic artery, a control injection is effected and an important decrease in flow is observed in the right hepatic artery.

the delivery catheter was the 0.038" Guidewire-Compatible Diagnostic Catheter 5F Dx Catheter.

The catheter was advanced until the distal tip of the catheter was near the occlusion site (corroborated with arteriography) in the right hepatic artery. The guidewire was removed, followed by the insertion of the tapered tip, the rotating luer was grasped and pressed to the hub and then rotated clockwise. The delivery wire was advanced and placed and then, the delivery catheter was retracted to deploy the device at the occlusion site. Position of the device was verified using the marker bands. Delivery catheter and wire were removed.

Outcome of procedure was positive and the patient progressively stabilized. Patient was discharged four days later with normal bilirubin concentration and no symptoms nor clinical signs. Patient was followed up with subsequent tomography controls at three and eight months after procedure (**Figure 6(a)**, **Figure 6(b)**).



(a) (b)

Figure 6. (a). 8 months post-treatment with endovascular therapy angiotomography. (b). Volume reconstruction where an artifact produced by the material is observed.

4. Discussion

Although pseudoaneurysms are a relatively rare entity, having a very high risk of rupture and being potentially lethal, makes them a really important possibility, they are a latent and probable early complication of abdominal trauma andseveral surgical procedures such as cholecystectomy, liver procedures, pancreatic surgeries or gastric bypasses [11] [12] [13]. Endovascular treatment however conservative is a widely performed procedure that has evolved to be the gold standard in the treatment of vascular occlusions and has demonstrated to be even safer than surgical treatments (such as ligation or revascularization) and hepatic pseudoaneurysms are not the exception [13] [14] [15] [16] [17].

Endovascular treatment has demonstrated to be a safe option for several occlusive conditions, even reducing in certain cases the risk of ischemia and obviously, death. However, AVP4 is commonly not the first option of treatment, but coil embolization [13] [14]. Due to urgency (having clinical data of hypovolemic shock) and having no coils that could appropriately exclude the pseudoaneurysm, the decision of occlusion of the pseudoaneurysm nutrient artery was made [14] [17] [18] [19].

The Amplatzer Vascular plug 4 (AVP 4) is a three-dimensional mesh occlusive device which is attached to a screw delivering system and is a highly effective system that has demonstrated to be beneficial in several vascular pathologies mainly compared versus medical care alone having high success rates and very low complications [17]-[22].

It is not traditional to use of AVP 4 systems for treatment of pseudoaneurysms and hepatic artery pseudoaneurysms and neither we support the idea of replacing the use of coil embolization with AVP4. However, in regard to treatment options, we encourage physicians to consider and use AVP4 systems in cases where they do not have access or availability of coils for embolization, mainly if the case itself is an emergency.

5. Conclusion

Although the sacrifice of nutrient artery with AVP4 might not be the most appropriate treatment for pseudoaneurysms, due to urgency, Amplatzer Vascular Plug 4 may be a safe option, showing an adequate thrombosis after placement and having no recanalizations, hepatic lesions nor vascular wounds in posterior tomographic controls.

Patients Consent

Informed consent for use, analysis and publication of data for educational, divulgation and scientific aim was obtained assuring confidenciality of pertinent information and identification of both patients. First case patient and next to kin signed informed consent form. Second case patient's widow and next of kin signed informed consent form due to occupational fatality (oil industry).

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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