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A novel technique for treating visceral artery pseudoaneurysm: Selective arterial embolization with cut-inflated-deflated balloon

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Introduction

Visceral artery pseudoaneurysm is a rare acute abdominal condition that might be caused by inflammation, infection, vasculitis, post-traumatic damage, connective tissue disease, iatrogenic damage, segmental arterial mediolysis, or malignancy (1-4). The number of cases of visceral artery pseudoaneurysm treated with new endovascular and percutaneous techniques is increasing due to technological advancements over the last two decades (5, 6). In this paper, we present a new technique for the endovascular treatment of visceral artery pseudoaneurysm using selective arterial embolization of a cut-inflated-deflated balloon technique.

Case Report

A 65-year-old female patient presented at the emergency department with abdominal pain, nausea, and vomiting. She had a history of having undergone surgery 15 days previously due to gastrointestinal malignancy. Physical examination revealed blood pressure of 80/45 mm Hg, with 14 respirations per minute and a heart rate of 100 beats per minute. Initial blood results showed hemoglobin of 6.24 g/dL, white cell count of 12.500 mm^3, and platelets of 350.000 mm^3. Contrast-enhanced abdominal computed tomography (CT) showed contrast extravasation in a branch of the superior mesenteric artery. We decided to perform an endovascular treatment due to the patient's recent history of surgery and her increased mortality risk. For this, the patient was taken to the catheter laboratory. A 6-Fr sheath was inserted into the femoral artery, and a 6-Fr right Judkins guiding catheter was used to cannulate the superior mesenteric artery ostium. Superior mesenteric artery angiography showed contrast extravasation and pseudoaneurysm. An 8-Fr sheath was placed into the femoral artery after the branch of the superior mesenteric artery pseudoaneurysm was identified. Then, a 7-Fr renal double curve guiding catheter was used to engage the ostium of the superior mesenteric artery. The lesion was successfully crossed with a

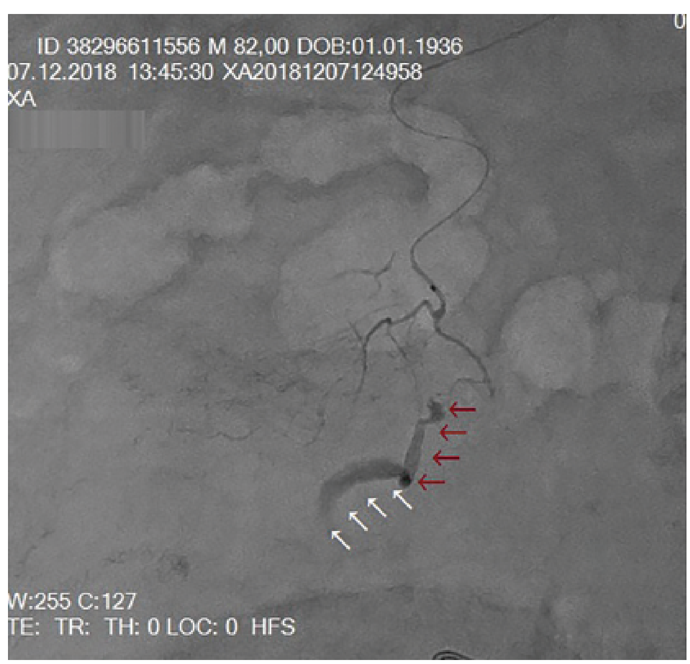

Figure 1. Angiogram of the superior mesenteric artery showing a perforated segment (white arrows) and pseudoaneurysm (red arrows) in the branch of the superior mesenteric artery

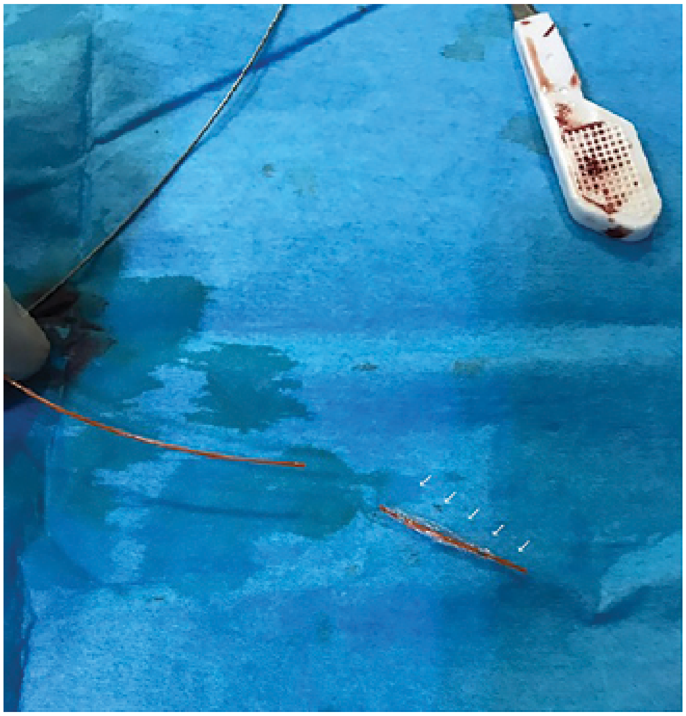

Figure 2. The balloon catheter was cut using a scalpel (white arrows)

0.014-inch wire under fluoroscopic guidance. Then, the ruptured branch of the superior mesenteric artery pseudoaneurysm was selectively visualized with a microcatheter (Video 1, Fig. 1). Next, the inflated-deflated balloon catheter was cut with a scalpel (Video 2, Fig. 2). The cut-inflated-deflated balloon was advanced into the segment of extravasation with a microcatheter over 0.014-inch wires (Videos 3 and 4). After the inflated-deflated balloon was delivered, the 0.014-inch wire was removed (Fig. 3). After embolization with the cut-inflated-deflated balloon, selective

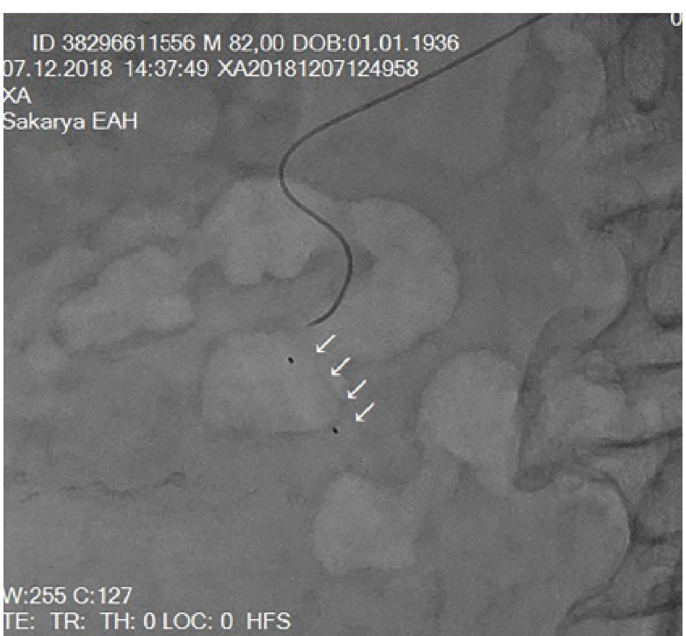

Figure 3. White arrows show the cut-inflated-deflated balloon catheter

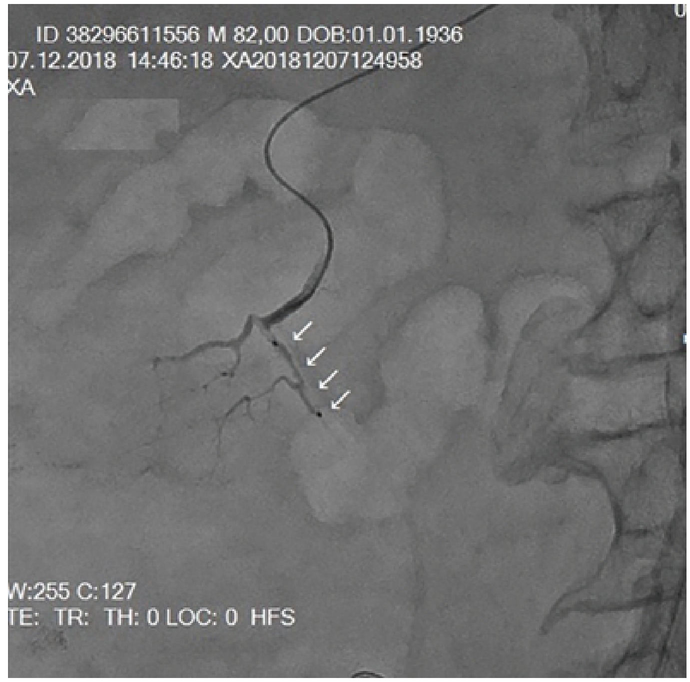

Figure 4. Angiogram displaying complete sealing of the perforation after implantation of the cut-inflated-deflated balloon catheter (white arrows)

imaging was performed with the microcatheter, again. We observed that the contrast extravasation completely disappeared after embolization with the inflated-deflated balloon (Video 5, Fig. 4). The patient was discharged uneventfully on the sixth day of hospitalization.

Discussion

The actual incidence of pseudoaneurysms is unknown. The majority of patients with visceral artery pseudoaneurysm are symptomatic, with asymptomatic patients constituting only approximately 2%–3% of the total (7). Because the risk of rupture is high, all visceral artery pseudoaneurysms must be treated promptly irrespective of their size, location, and symptom status. When left untreated, mortality rates in patients with a pseudoaneurysm can be 90%–100% (1, 8, 9).

In patients with a visceral artery pseudoaneurysm, endovascular and percutaneous techniques are effective and reliable treatment options, in addition to being minimally invasive in comparison to surgery. Patient comorbidity or anatomic suitability is important in the choice of treatment. In recent years, most patients with a pseudoaneurysm have been treated with endovascular and percutaneous methods (5, 6). If percutaneous and endovascular treatments fail, surgical treatment should be considered as an alternative. The major advantages of endovascular and percutaneous treatment techniques are the avoidance of general anesthesia, immediate post-procedure angiographic control, low risk of complications, and faster recovery.

Graft-covered stents and embolic materials are used in endovascular and percutaneous treatment techniques, either alone or in combination. The decision to perform endovascular treatment with embolic materials or stenting is based on the size of the pseudoaneurysm, the neck of the pseudoaneurysm, the parent artery, whether the artery is expendable, nonexpendable, or tortuous, the location of the pseudoaneurysm, and the patient's coagulation parameters (6, 10).

Many types of materials are used for embolization, such as coils, microcoils, cyanoacrylate glue, foam gelatin, amplatzer vascular plugs, ethylene vinyl alcohol copolymer (EVOH-Onyx®), tris-acryl gelatin microspheres, polyvinyl alcohol (PVA), or calcium alginate gel (ALGEL) particles (11). Coils may be preferred in expendable arteries or pseudoaneurysms with a narrow neck. The diameter of the coil should be 20% greater than the diameter of the vessel. Sac packing, proximal occlusion, the sandwich technique, and stent-assisted and balloon remodeling techniques can be used in coil embolization. Some risks, such as of rupture, infection, and non-target embolization, are associated with coil embolization. Liquid embolic agents are used with tortuous and small arteries in patients with a visceral artery pseudoaneurysm. The disadvantages of liquid embolic agents are the risk of catheter trapping, non-target embolization, and infection. Additionally, an allergic reaction can occur when using thrombin (6, 10).

Graft-covered stents may be more appropriate in large-diameter vessels and pseudoaneurysms. Graft-covered stent placement is not possible in small branches of the mesenteric artery, as seen in the case presented in this paper. Stenting may not be suitable if the vessel has sharp angulation or severe tortuosity. If a stent is to be implanted, balloon-expandable stents should be preferred for the straight proximal segment of the mesenteric artery and self-expandable stents should be preferred for tortuous arteries. A minimum distance of 10 mm on both sides of the pseudoaneurysm is recommended to ensure an adequate seal (10).

Detachable balloons, applied in a technique similar to the method we are proposing, are used especially in the treatment of cranial aneurysms and arteriovenous fistulas. Detachable balloons can have an instant and precise occlusive effect on large arteries and fistulae; however, unlike any other embolization technique, the occlusion is reversible until the balloon is finally detached (12). Our technique is an example of the manual construction of a similar detachable balloon technique.

Percutaneous treatment can be performed in large, superficial, relatively narrow necked and solid organ pseudoaneurysms under ultrasonography or CT guidance. Embolic materials are used in this approach, and the complications of this method are similar to those found with endovascular treatment. The patient in our case was not eligible to undergo percutaneous treatment due to the presence of a small, deep, and intestinal artery pseudoaneurysm. Since we did not have coil and embolic materials in our catheter laboratory, we successfully managed to treat the ruptured visceral artery pseudoaneurysm using the embolization technique with a cut-inflated-deflated balloon. This method is less costly than coil embolization. Bleeding in the small vessels can be easily controlled with this method. Potential complications of this method include non-target embolization, migration after embolization, infection, and recurrence of the pseudoaneurysm. No previous study has reported on the use of the embolization technique with a cut-inflated-deflated balloon to treat a visceral artery pseudoaneurysm. This method has several advantages: it is effective, easy-to-use and affordable, and it can be used in all catheter laboratories.

Conclusion

In conclusion, embolization with a cut-inflated-deflated balloon technique is an easy, inexpensive, effective treatment option for patients with a visceral artery pseudoaneurysm.

Informed consent: Written informed consent was obtained from the patient for publication of the case report and the accompanying videos and images.

Video 1. Angiogram shows a perforated segment and pseudoaneurysm in the branch of the superior mesenteric artery.

Video 2. The balloon catheter was cut using a scalpel.

Video 3. The cut-inflated-deflated balloon loaded over the guidewire.

Video 4. The cut-inflated-deflated balloon catheter was advanced into the segment of extravasation with a microcatheter over the guidewire.

Video 5. Angiogram demonstrates complete sealing of the perforation after implantation of the cut-inflated-deflated balloon catheter.

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An unusual case of cardiac lymphoma diagnosed using computed tomography-guided percutaneous transthoracic biopsy

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Introduction

Cardiac tumors are the extremely rare and least investigated tumors in oncology. The most common type of tumor originating primarily in the heart is myxoma, while other types are sarcoma, lipoma, fibroelastoma, teratoma, lymphoma, and mesothelioma. Only 10% of cardiac tumors are malignant, and 95% of which are sarcomas and remaining 5% are lymphomas and mesotheliomas (1).

Primary cardiac lymphoma (PCL) is a type of non-Hodgkin lymphoma, which originates from myocardium or pericardium and those are the only sites of involvement at the time of diagnosis. The patients are mostly, but not always, admitted with cardiac manifestations (2). PCL is very rare and fatal unless it is diagnosed and treated on time. Patients with PCL usually die few months after diagnosis (3, 4).

In this article, we present a challenging case of PCL diagnosed using computed tomography (CT)-guided percutaneous transthoracic biopsy of the cardiac mass encircling the atrioventricular septum.

Case Report

A 63-year-old female patient was admitted to the cardiology clinic with the complaints of dyspnea, weight loss, edema on the legs, and prominent fatigue. According to her definition, she has lost more than 8 kg in the last 2 months, involuntarily. She has a history of diabetes and was on metformin for the last 6 years with excellent glycemic control. She did not report any microvascular complications. She did not have any history of cardiac or pulmonary diseases. In the physical examination, it was found that she had clear S1 and S2, her pulse was regular, and no murmur or gallop was heard. There was prominent pretibial edema on both legs. The laboratory results revealed a high sedimentation rate of 85 mm/h, normal complete blood count except mild iron deficiency anemia (Hb: 11 mg/dL, MCV: 72, and ferritin: 3), elevated C-reactive protein (22 mg/dL), and three-fold increase in lactate dehydrogenase (650 u/L, normal range: 110–206 u/L). ECG and routine biochemistry were normal. As the patient described that dyspnea was worsening during exercise or emotional stress, echocardiogram and chest CT were ordered. The transthoracic echocardiogram which was performed under suboptimal conditions revealed normal ejection fraction and no thrombus, vegetation, or intraventricular mass. In the chest CT, a

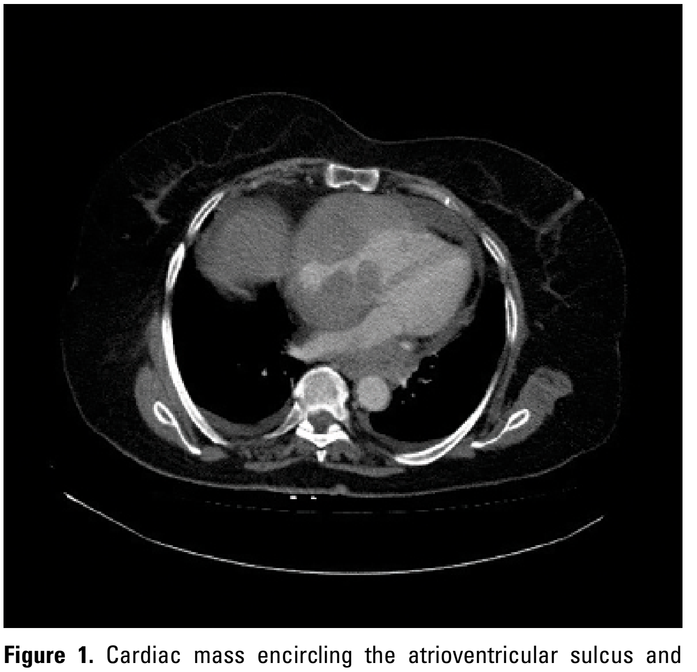

Figure 1. Cardiac mass encircling the atrioventricular sulcus and atrium wall