SHORT REPORT

Application of Temporary Filter During Percutaneous Transcatheter Embolization with Macro Coils of High-flow Massive Renal Arteriovenous Fistula

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Angiographic evaluation and management of renal arteriovenous fistula (AVF) with embolization has become the treatment of choice replacing, in most of the cases, surgical intervention.

We describe a case of a high-flow post-traumatic massive renal AVF in a 37-year-old man successfully treated with detachable stainless steel macro coils in which a temporary filter was applied to avoid coil migration. The use of a suprarenal retrievable filter, a minimally invasive manoeuvre, could considerably improve the safety of macro coils embolization of massive renal AVFs.

Keywords: Temporary filter; Macro coil embolization; Renal arteriovenous fistula.

Introduction

Transcatheter embolization of renal arteriovenous fistula (AVF) is associated with high success rates, but complications can occur, especially in AVF with rapid blood flow. We describe a case of a high-flow post-traumatic massive renal AVF successfully treated with detachable stainless steel macro coils in which a temporary filter was applied to avoid coil migration.

Report

A 37-year-old man was admitted for gross hematuria with normal renal function (creatinine level: 0.8 mg/ml) and normal arterial pressure. Fifteen years before he had been involved in a motorcycle accident and sustained a blunt trauma to the right postero-lateral flank which caused pain with transient gross hematuria. Colour-Doppler US of the right kidney demonstrated a hilar vascular mass with calcification, characterized by arterial flow with very low resistance, suggestive for AVF.

Spiral computer tomography (CT) showed a dilated right renal artery filling a large, rounded vascular structure characterized by peripheral calcifications. Angiography demonstrated a large aneurysmatic arteriovenous communication between a segmental renal artery branch and a venous vessel (Fig. 1A).

Given the large size of the vascular structures and the high risk of potential spontaneous rupture of the aneurysmatic lesion, embolization was considered as a therapeutic alternative to nephrectomy. A 7-F curved guiding sheath (Bulking up and over; Cook, Bjaeverskov DK) was transfemorally placed with the tip into the mid portion of the renal artery. To avoid possible migration of the coils into the venous circulation, a temporary vena cava filter (Prolyser Cordis, Europe Roden NL) was placed into the suprarenal inferior vena cava (IVC), through the right jugular vein. Detailed anatomical map was made to assess the narrowest segment of the feeding artery with an occlusion balloon (OB Berenstein 11.5; Meditech; Boston Scientific Corporation; Watertown MA). Embolization with three macro coils was then undertaken with the use of one 12 mm Jackson mechanically controlled
detachable stainless steel coil (Cook, Bjaeverskov DK) and two 8 mm persistently patent ductus arteriosus detachable coils (Cook, Bjaeverskov DK) (Fig. 1(B)). The final control image demonstrated no further flow through the AVF with preserved nephrogram (Fig. 1(C)). The temporary vena cava filter was subsequently removed. The patient tolerated the procedure well and did not experience abdominal discomfort.

In the 2 days after the procedure patient’s urine rapidly cleared, while creatinine level and blood arterial pressure remained within the normal values. The patient was discharged from the hospital and clinical and laboratory follow-up at 1, 3 months showed no complications. At 6 months, a $^{99m}$Tc-DTPA renal scintigram was performed showing a normal vascular, parenchymal and excretory phase of the kidneys. At 9 months, a spiral CT with contrast media showed the normal size of the right renal artery, occlusion of the AVF and a normal contrast enhancement of the right kidney (Fig. 2(A) and (B)).

Discussion

Acquired renal AVFs result from invasive procedures, trauma, renal biopsy or surgery, inflammatory renal disease, or renal cell carcinoma. They are characterized by a high-flow due to the increase renal artery diameter and the considerable dilatation of renal vein and suprarenal IVC. Clinical manifestations of renal AVF depend on their size and location: although often asymptomatic, hematuria, hypertension, high-output cardiac failure and even rupture may occur.

Angiography, not only remains the ‘gold standard’ for diagnosis, but also offers the potential for therapeutic intervention. Indeed, transcatheter vascular occlusion has become the treatment of choice replacing, in most of the cases, surgical intervention. The choice of an appropriate embolic material and an accurate site for embolization of an AVF is crucial.

There are a number of options now available for embolization of renal AVF. However, small embolic materials as absorbable gelatine sponge, small embolic particles and liquid agents (glue or alcohol) are not suitable for large AVF and they are not captured by a temporary vena cava filter.

In the case here reported, due to the high-flow and the large diameter of the renal AVF, the possible temporary vena cava filter placed in the suprarenal inferior vena cava (arrow). (C) Selective angiography of the right renal artery at the end of the procedure showing exclusion of the large aneurysmatic arteriovenous communication.

Fig. 1. (A) Panoramic aortography demonstrates an enlarged right renal artery feeding a large aneurismatic communication with a venous vessel and the early passage into the inferior vena cava. (B) Image showing the three coils (arrow head) completely packed after deployment; note the
Embolic agents to be used are big embolic materials as macro coils or detachable balloons: we decided to use mechanically controlled detachable stainless steel macro coils, since they have an easier deployment and longer occlusive proprieties.\(^2,3\)

The optimal site, for positioning the coil in a large AVF, is the narrowest segment of the feeding artery beyond its normal arterial branches.\(^3\) This can be detect with the inflation of an occlusion balloon and deployment of coils beyond the inflated balloon.\(^4\)

Macro coils can then be delivered through the lumen of the balloon catheter into the stagnant distal lumen of the feeding artery.\(^3,4\) Complications of transcatheter embolization are reported, such as segmental renal infarction or distal embolization in the pulmonary circulation have been described. Small embolic material can migrate into the pulmonary circulation and give rise to multiple pulmonary embolisms. Similarly big embolic material can produce a massive pulmonary embolism with a possible circulatory collapse and shock of the patient.\(^5\) To avoid distal embolism into the pulmonary circulation due to macro coils, we placed, through the right jugular vein, a temporary vena cava filter in the suprarenal IVC. No embolisms were noted in our patient.

This kind of temporary filter was chosen for its ‘basket shape’ that can catch big embolizing material as the size of macro coils that we have used. If the macro coil should be captured by the filter, there are two possible recover techniques: to catch the macro coil inside the filter with a goose-neck or to pull the filter till the right jugular vein and surgically remove the tip of the filter with the macro coil. We feel that the use of a suprarenal retrievable filter, a minimally invasive manoeuvre not previously reported in the literature, considerably improve the safety of macro coils embolization of massive renal AVFs.

**References**


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