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RCR RADIOLOGY CASE REPORTS

Interventional Radiology

Simultaneous transarterial and transvenous coil embolization for a large aneurysmal-type renal arteriovenous fistula

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ABSTRACT

A 74-year-old woman underwent abdominal computed tomography for screening, and a right large aneurysmal-type renal arteriovenous fistula (AVF) was found incidentally. The venous sac of the renal arteriovenous fistula was enlarged, and coil embolization was considered. To prevent severe complications such as coil migration, pulmonary embolism, and rupture during procedure, coil embolization was approached via both the feeding artery and the draining vein simultaneously, with balloon occlusion of the feeding artery. It was accomplished successfully, and the patient could discharge without complication.

Introduction

Aneurysmal-type renal arteriovenous fistulas (AVFs) are often asymptomatic but can present with hematuria, pain, hydronephrosis, and heart failure [1]. Transcatheter embolization is associated with high success rates [2]. However, some complications can occur, such as renal infarction, coil migration, pulmonary embolism after the procedure, and rupture of AVF during procedure. Thus, it is important to consider how to prevent such complications in making a strategy of transcatheter embolization. The coil migration rate was reported to be 8% [3]. The incidence of pulmonary embolism has not been reported so far, but case reports of pulmonary embolism and inferior vena cava thrombus exist [4,5]. AVF rupture during the procedure has not been reported, but it could occur in theory [1]. To occlude AVF, transarterial coil embolization is necessary; thereby coil migration and pulmonary embolism may occur. So, we thought transvenous coil embolization could prevent them. However, transvenous coil embolization may increase the pressure of the inside of the AVF and it may induce rupture of AVF. Therefore, we considered that balloon occlusion of the feeding artery could prevent it. Here, we present a case with a large aneurysmal-type renal AVF, treated successfully without

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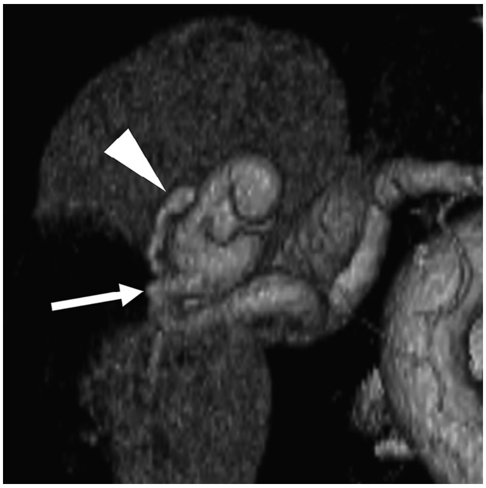

Fig. 1 – 3-Dimensional computed tomography angiography revealed a large aneurismal-type renal arteriovenous fistula with a single feeding artery (arrow) and a single draining vein (arrowhead).

complications by simultaneous transarterial and transvenous coil embolization with balloon occlusion of the feeding artery.

Case report

A 74-year-old woman underwent abdominal computed tomography for screening, and a right large aneurysmal-type renal AVF was found incidentally. She had no symptoms and the renal AVF was followed up. However, the venous sac of the renal AVF enlarged after 2 years of follow-up (Fig. 1). So, coil embolization for this renal AVF was considered and was performed in the following manner. To prevent the formation of a thrombus during the procedure, 3000 units (1000 units/mL) of heparin were administered intravenously. A 5Fr guiding sheath (Ansel; Cook, Bloomington, IN) was introduced from the right femoral artery and placed at the right renal artery, and another 5Fr guiding sheath (Ansel) was introduced from the right femoral vein and placed at the right renal vein. From the arterial side, a 5Fr balloon catheter (Selecon MP catheter; Terumo, Tokyo, Japan) was introduced, and it was followed by a microcatheter (PX SLIM; Penumbra, Alameda, CA). From the venous side, a 4Fr catheter (Cerulean G; Medikit, Tokyo, Japan) was introduced, and it was followed by a microcatheter (PX SLIM) also. Both the arterial and the venous microcatheters were placed at the venous sac. With inflation of the 5Fr balloon catheter, coil embolization was started using Ruby Coils (Penumbra). At first, from the venous microcatheter, we embolized the upper part of the venous sac and the draining vein. At this time, we paid attention not to embolize it completely in order not to increase the pressure of the inside of the AVF. Then, from the arterial microcatheter, we embolized the lower part of the venous sac and the feeding artery until complete cessation was confirmed (Fig. 2). This patient did well without any complication, and follow-up magnetic resonance angiography performed 1 year later revealed disappearance of the AVF.

Discussion

Some severe complications related to embolization can occur for aneurysmal-type renal AVF: (1) migration of coils caused by rapid blood flow of the AVF [6]; (2) pulmonary embolism after the procedure; and (3) rupture of the AVF during the procedure. Rupture of the AVF during the procedure has not been reported, but Maruno et al [1] stated that it could theoretically occur because of the increased pressure of the inside of the AVF by balloon occlusion in the draining vein. Pulmonary embolism after the procedure from thrombosis developing in the sac of the AVF has been reported [4]. Prokesch et al [3] reported that coil migration rate was 8% (2 of 25). In the literature, some techniques have been reported to prevent the migration of coils caused by rapid blood flow, such as use of detachable coils [6], use of a constrained wall stent [7], and occlusion of both a draining vain and a feeding artery using balloons [8]. However, there is no report discussing

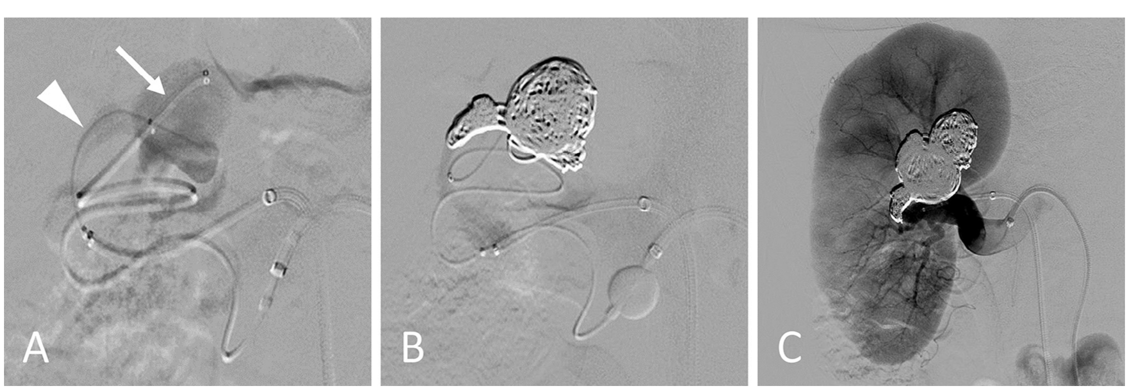

Fig. 2 – (A) One microcatheter was placed at the venous sac from arterial side (arrow) and the other was placed from the venous side (arrowhead). (B) Coil embolization was performed from the venous side first. We paid attention not to embolize it completely in order not to increase the pressure of the inside of the arteriovenous fistula (AVF). (C) Then, coil embolization from the arterial side was performed, and angiography of the right renal artery showed disappearance of the AVF without renal infarction.

embolization techniques for aneurysmal-type renal AVF to prevent rupture of the AVF and pulmonary embolism from thrombosis in the sac of the AVF. To prevent all these complications, we introduced the simultaneous transarterial and transvenous embolization technique and balloon occlusion of the feeding artery. The simultaneous transarterial and transvenous embolization technique can help make tight and short-segment embolization of the feeding artery, and of course it can prevent renal infarction. Furthermore, in this technique, coils would be placed in the venous sac and draining vein, and thus it may prevent pulmonary embolism caused by thrombosis in the venous sac. Balloon occlusion of the feeding artery can decrease blood flow of the feeding artery and prevent migration of coils. In this case, we paid attention not to embolize the draining vein completely, considering the increase of the pressure of the inside of the AVF, even with balloon occlusion of the feeding artery. When the balloon of the feeding artery migrates or deflates accidentally, the pressure of the inside of the AVF increases and causes rupture. So, we avoided the balloon occlusion in the draining vein, although it seemed to be useful to prevent migration of coils.

For venous access in this technique, a 5Fr guiding sheath, a 4Fr catheter, and a microcatheter are additionally required and more coils are also necessary. Furthermore, the procedure time may be longer because of the addition of the venous procedure. However, we think such cost and time are reasonable, considering the cost of treatment for complications and burdens that are placed on patients. Furthermore, this technique is not so specialized and can be performed with conventional skills.

In conclusion, we think this simultaneous transarterial and transvenous embolization technique and balloon occlusion of the feeding artery can contribute to coil embolization of the aneurysmal-type renal AVF, thus avoiding severe complications.

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