



Vascular and Interventional Radiology Case Report

Coil embolization of a complex renal artery aneurysm using a new scaffold (Comaneci) device – A case report

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ABSTRACT

Advances in endovascular approaches have resulted in increasing utilization of minimally invasive techniques to treat visceral artery aneurysms including renal artery aneurysms (RAAs), with high rates of success. The basic endovascular approach to treating RAAs includes stent graft exclusion or coil embolization. Treatment of RAAs with wide necks or at the bifurcation of the main vessel is facilitated by scaffolding techniques, which have been previously described. These techniques have their limitations and cannot be used in all situations. We describe a scaffolding technique using the Comaneci device (Rapid Medical, Israel), a retrievable mesh device meant for intracranial treatment of wide neck or bifurcation aneurysms that we used to safely and successfully treat a 2 cm RAA.

Keywords: Comaneci, Embolization, Renal artery aneurysm, Stent, Coils

INTRODUCTION

Renal artery aneurysms (RAAs), like any visceral aneurysm, pose risk of rupture which can be life threatening.^[1,2] RAAs have historically been managed with surgery; however, endovascular techniques have been shown to be safe and effective for the treatment of RAAs.^[2] In general, indications for the treatment of RAA include aneurysm size >2.0 cm, rapid enlargement, and women who are planning on pregnancy.^[3] The treatment of RAAs associated with symptoms including hypertension or hematuria is also recommended.^[3] Endovascular treatment usually involves coiling the aneurysm sac. Anatomical challenges including multiple segmental efferent arteries arising from the aneurysm sac or a wide neck pose technical challenges to successful embolization.^[4] The major risk associated with coiling such aneurysms includes inadvertent coil migration into the parent vessel, which can result in organ ischemia and tissue infarction.^[4] Stent- and balloon-assisted coiling (BAC) of visceral aneurysms have been previously described.^[5] The stent-assisted coiling (SAC) provides the necessary scaffolding to support the coil mesh and enhance the effectiveness of embolization but has drawbacks like the need for dual antiplatelet therapy after the procedure and runs the risk of future failure in terms of stent occlusion.^[5,6] BAC also facilitates adequate compaction and retention of coils; however, it has the disadvantage of flow disruption in the distal vessels as long as the balloons remain inflated.^[7] Although small, there is a risk of distal tissue infarction from this. The Comaneci device is a non-flow occluding retrievable flexible mesh device developed for intracranial aneurysm coiling. We present a case of Comaneci-assisted coiling of an incidentally detected RAA.

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CASE REPORT

A 68-year-old male undergoing a workup for hematuria was found to have a 2 cm RAA on a non-contrast CT. Laboratory values including hemoglobin were normal. He was, then, referred to our hospital for further management. Following discussion at the multidisciplinary committee, it was decided to treat the RAA through endovascular technique. The pertinent details of the procedure including the off-label use of the Comaneci device to treat the RAA were discussed with patient in our clinic. Other treatment options included open surgical reconstruction through *in situ* or *ex vivo* techniques. Before coil embolization, a planning Nexaris Angio-CT (Siemens, Erlangen, Germany) [Figure 1] was performed after obtaining right femoral arterial access and cannulating the right renal artery with a 5 French cobra catheter. Based on the 3D volumetric images [Figure 2], a decision was made to use the Comaneci device to protect the segmental arteries and facilitate coiling of the aneurysm. For the coiling procedure, access was obtained in the right femoral artery. A 7 French destination sheath (Terumo, Somerset, NJ) was placed in the right renal artery. Three separate 2.0 F TruSelect catheters (Boston scientific, Marlborough, MA) were used to individually select the two segmental arteries and the aneurysm sac. The Comaneci devices were advanced through the microcatheters in the segmental vessels and deployed as per the manufacturer's recommendation [Figure 3]. Once the devices were deployed adequately protecting the segmental vessels, coil embolization was performed through the microcatheter in the aneurysm sac. Following embolization, the Comaneci devices were withdrawn, and an additional angiogram was performed [Figure 4] to ensure adequate embolization and flow through the segmental vessels.

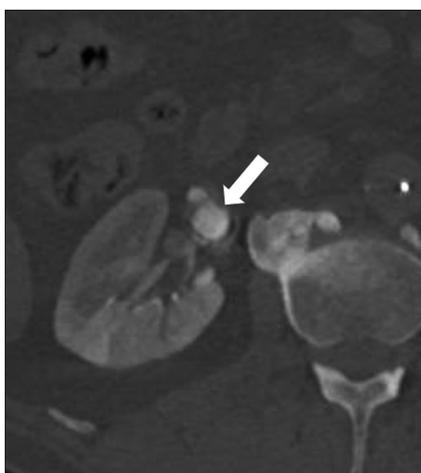


Figure 1: A 68-year-old male who presented with hematuria. Pre-operative contrast-enhanced axial CT angiogram showing a 2.0 cm aneurysm arising from the right main renal artery (white block arrow).

A follow-up CT angiography 1 month after the procedure demonstrated successful coiling without complication [Figure 5]. The patient has been followed up for 9 months at the time of submitting this manuscript, with no evidence of a residual/recurrent aneurysm.

DISCUSSION

RAAs have historically been an uncommon diagnosis in the general population, with incidence rates up to approximately 1% reported in the literature.^[1,8] However, increasing utilization of routine imaging in various health-care settings is a reasonable explanation for more incidental aneurysms

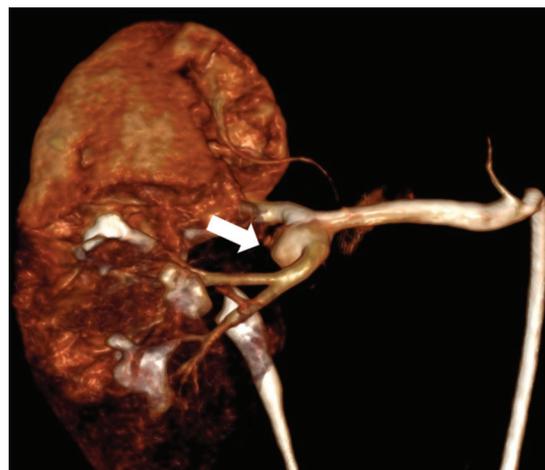


Figure 2: Computed tomography angiography 3D reconstruction in a 68-year-old male patient demonstrating the aneurysm arising from the distal right renal artery bifurcation (white block arrow).

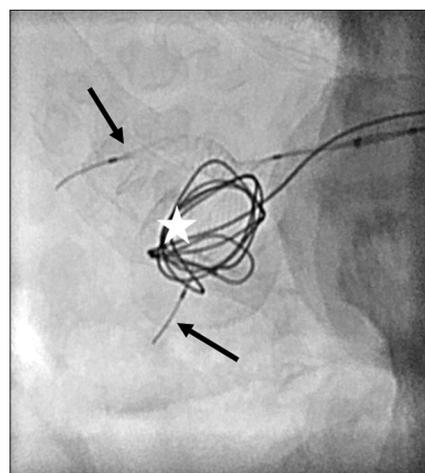


Figure 3: Fluoroscopic spot image in the 68-year-old male patient showing the Comaneci devices used as scaffolding in two separate segmental vessels (black arrows) during coil deployment (white star).

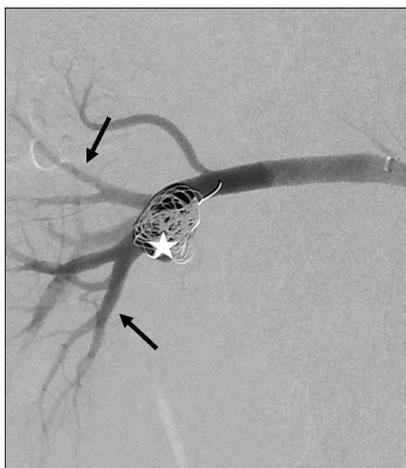


Figure 4: Digital subtraction angiogram of the right renal artery in a 68-year-old male patient showing successful coiling of the aneurysm (white star) with unchanged flow in the distal vessels (black arrows).

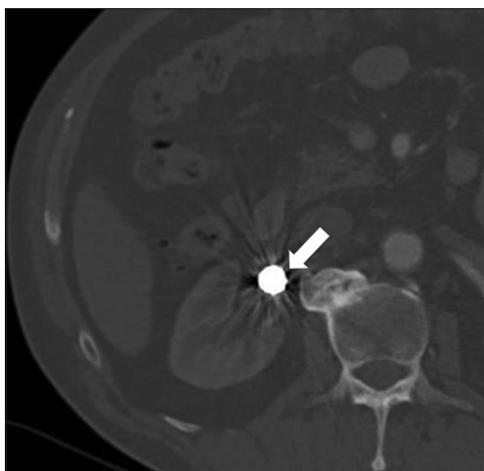


Figure 5: Follow-up contrast-enhanced computed tomography 1 month after the procedure in a 68-year-old male demonstrating successful embolization of the aneurysm (white arrow) with normal enhancement of the right kidney.

being recognized and ultimately treated. While rupture is rare, it can be fatal and, therefore, remains a concern in the setting of RAA.^[1-3] Despite controversy regarding indications for the intervention of RAA, large or rapidly increasing size, potential for pregnancy, and hypertension are indications in which definitive management are recommended.^[3]

Management of RAA has traditionally involved an open approach with *in situ* or *ex vivo* reconstruction. However, open surgery is invasive and carries inherent risk of perioperative complication, which is of greater concern in select patients that may not be suitable candidates for open

surgery. Advances in endovascular approaches have resulted in increasing utilization of minimally invasive techniques in various settings, including the treatment of RAA, with high rates of success.^[4,9] Endovascular therapy has been shown to have decreased post-operative complications, length of hospital stay, and requirement of nursing services after discharge.^[9] As such, an endovascular approach is now received as a first-line option for definitive management.

Endovascular treatment of RAA encompasses an array of previously described techniques including use of liquid embolic agents, stent graft reconstruction, and coil embolization with success rates of >90% reported in the literature.^[4] However, despite advances in techniques over the past couple decades, complex RAAs have been historically difficult to treat endovascularly.^[5,7] Traditional coil embolization carries risk of unintentional coil migration and end-organ infarction, and a wide neck or multiple branching vessels can exacerbate this risk.^[4,5,7] Variations of the technique including stent-assisted coiling and balloon-assisted coiling were developed in attempts to overcome some of these barriers and have been shown to be effective in management of aneurysms with an unfavorable ratio.^[5,10] However, these techniques are not without limitations. BAC halts forward blood flow compromising end-organ perfusion and can also cause vessel damage increasing risk of thromboembolic events or aneurysm rupture.^[10,11] SAC mitigates the disruption in distal perfusion encountered with BAC but commits the patient to long-term dual-antiplatelet therapy after the procedure which is not always feasible.^[10] There is also the risk of stent fracture and occlusion over time. In addition, these techniques are not ideal for cases in which preservation of one or more segmental vessels arising from the aneurysm sac is desired, as in the present case.^[7]

The Comaneci device has been approved for use in the management of wide neck intracranial aneurysms in which a temporary scaffolding device allows for adequate coiling of the aneurysm while preserving forward blood flow through its mesh design.^[12] It is also advantageous over balloon-assisted coiling in navigating eccentric anatomy and preserving outflow of branching vessels associated with the aneurysm sac.^[6] In addition, avoidance of post-procedural dual antiplatelet therapy is likely feasible.^[6] Since receiving FDA approval in the United States in 2019, its use has broadened to include management of not only cerebral but also other visceral aneurysms as well.^[6,10,13] In this report, we present a case of RAA with unfavorable anatomy due to its location at the bifurcation of segmental vessels, managed with simultaneous use of two Comaneci devices to successfully exclude the aneurysm.

The presence of segmental vessels arising at the RAA proved an obstacle when considering standard endovascular approaches for management such as SAC or BAC,

considering multiple outflow vessels could be compromised, increasing risk of distal organ infarction. Therefore, with goals to mitigate disruption of forward flow, the non-flow-limiting Comaneci device deployed in not one, but two, selected segmental vessels allowed for maximum preservation of distal perfusion during embolization. The simultaneous use of the devices was performed without difficulty or complication intraoperatively in addition to reassuring follow-up imaging 9 months postoperatively. From the short-term follow-up available, it would be hard to address the long-term outcomes of RAA treatment using such new scaffolding techniques.

CONCLUSION

The use of the novel Comaneci device in the management of complicated RAA is feasible and our positive experience supports its extended use in this setting. We hope this report will provide physicians with insight and confidence to utilize this approach in carefully selected patients.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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