

Renal Artery Aneurysm Exclusion

A new device for treating this rare but significant aneurysmal disease.

BY GUSTAV R. ELES, DO; MARK H. WHOLEY, MD; AND TEJAS MEHTA, MD

Renal artery aneurysms are relatively rare, and their natural history is unknown. Autopsy studies rate their incidence to be approximately .1%,¹ whereas general aortography studies reveal an incidence of .3%.² Arteriography performed in patients with suspected renovascular hypertension shows an incidence of 1.3%.³ Although rare, there are long-term sequelae related to this entity that merit further intervention. These sequelae include hypertension with end-organ damage, chronic renal dysfunction independent of hypertension, and most importantly, rupture of the aneurysm. Mortality associated with rupture is estimated to be approximately 10%;⁴ the mortality rate was even higher when associated with pregnancy.

Most renal artery aneurysms are found incidentally during work-ups for hypertension or other abdominal

pathology. Most are asymptomatic, but some patients may complain of flank pain and/or hematuria.

It has been postulated that renal artery aneurysms may contribute to hypertension through a variety of mechanisms, including renal ischemia secondary to altered blood flow from the kinking of the inflow artery, as well as microembolization from thrombus within the aneurysmal sac itself, resulting in microinfarction of the renal parenchyma.

Indications for intervention, according to surgical literature, include (1) size >2 cm regardless of blood pressure status, (2) size >1 cm if hypertension is difficult to control, (3) increasing aneurysmal size, and, most importantly, (4) female gender and concurrent hypertension.⁵

Previous reports have described methods for treating renal artery aneurysms percutaneously. The first method



Figure 1. Anterior-posterior projection showing right renal arteriography. Aneurysmal sac is noted. Anterior-superior branch of the right renal artery is also noted.

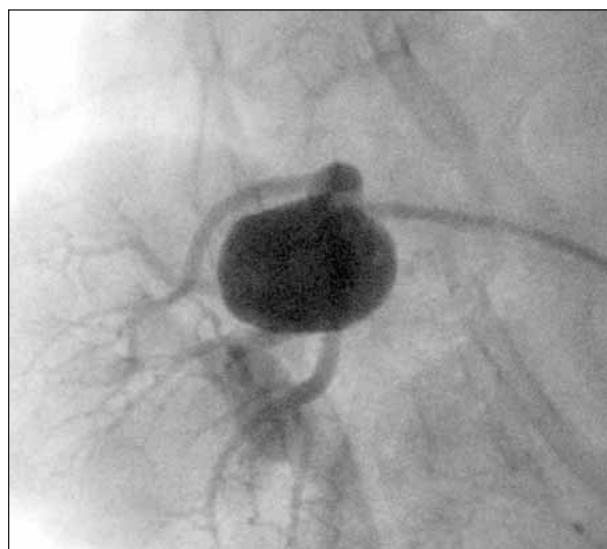


Figure 2. Caudal view of a right renal arteriogram. Aneurysmal sac is noted. Anterior-superior branch of the right renal artery is also noted.

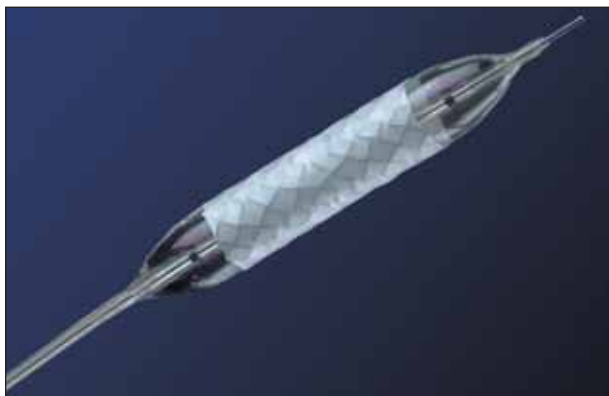


Figure 3. The iCast Covered Stent (Atrium Medical Corporation, Hudson, NH).

utilized Guglielmi coils (Boston Scientific Corporation, Natick, MA) for endovascular embolization.⁶ This method carries the risk of nonaneurysmal migration of the coils. A second method utilizing a stent graft has been described previously.^{4,7,8} This method also carries potential side effects, including the loss of branches of the renal artery secondary to “jailing” of these branches by the stent graft. Both procedures also carry the risk of angiography, including vascular complications at the arteriography site as well as instrumentation within the kidney itself.

CASE REPORT

A 51-year-old woman with a history of hypertension, splenectomy, hyperlipidemia, and right renal artery aneurysm, reported right-sided flank pain. The patient had undergone previous attempted right renal artery aneurysm exclusion 5 years prior using the Jomed stent graft (Jomed Ulestraten, The Netherlands) via a brachial percutaneous approach, as previously described.⁸ The procedure utilized a 19-mm stent graft mounted onto a 4.5-mm X 20-mm balloon. Several unsuccessful attempts were made to place the stent across the neck of the aneurysm; ultimately, the stent prolapsed into the aneurysmal sac itself. No further attempts were made at that time to treat the aneurysm.

The patient had right flank pain and persistent hypertension. She was on a hypertensive regimen including doxazosin (2 mg qhs), olmesartan (40 mg qd), and metoprolol succinate (200 mg qd). Systolic blood pressure typically was between 160 mm Hg and 170 mm Hg. Abdominal CT was performed to evaluate the renal artery aneurysm, which was found to be 28 mm at its maximum diameter. Two years earlier, the maximum diameter had measured 23 mm. Serum creatinine at that time was 0.7 mg/dL. Given the size of the aneurysm, the enlarging nature, and the clinical presentation of flank pain, the decision was made to bring the patient to the catheterization lab for further assessment.

MATERIALS AND METHODS

In the catheterization lab, consent was obtained for angiography and possible intervention. The patient had been on chronic aspirin therapy. The right groin was prepared in a sterile fashion, and a 6-F sheath was placed via Seldinger technique. Selective renal angiography was performed in the usual manner utilizing a 6-F JR4 diagnostic catheter (Cordis Corporation, a Johnson & Johnson company, Miami, FL). The left renal artery was unremarkable. The right renal artery and aneurysmal sac are shown in Figures 1 and 2. At this point, the decision was made to attempt exclusion of the renal artery aneurysm employing a premounted, balloon-expandable stent graft—the iCast Covered Stent (Figure 3).

The 6-F sheath was exchanged over a standard .035-inch wire for a standard short 8-F sheath. A 55-cm renal double curve (RDC) guide catheter (Cordis Corporation) was used to engage the right renal artery. Standard weight-based heparin was given (3,500 units) intravenously to maintain an activated clotting time at 200 to 250 seconds. Based on the diagnostic angiograms obtained in multiple views, it was believed that the greatest likelihood for successful exclusion would require placement of the stent from the main renal artery into the superior-anterior artery as it came off of the aneurysmal sac.

Initial attempts to wire the superior-anterior artery using a 300-cm, .035-inch Wholey wire (Mallinckrodt, a Tyco Healthcare Company, St. Louis, MO) were unsuccessful.

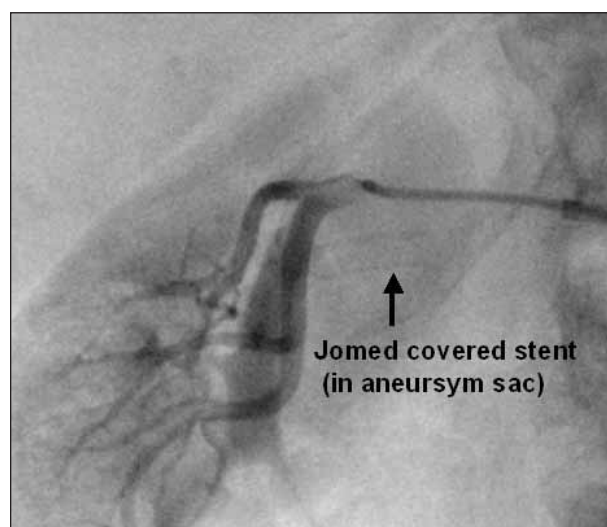


Figure 4. Anterior-posterior projection of right renal arteriogram is shown. An 8-F RDC catheter is shown engaged in the ostium of the main right renal artery. A 5-F IMA catheter (Cordis Corporation) is shown passing through the 8-F RDC guide into the anterior-superior branch of the right renal artery. The previously placed Jomed stent is shown in the aneurysmal sac (arrow).

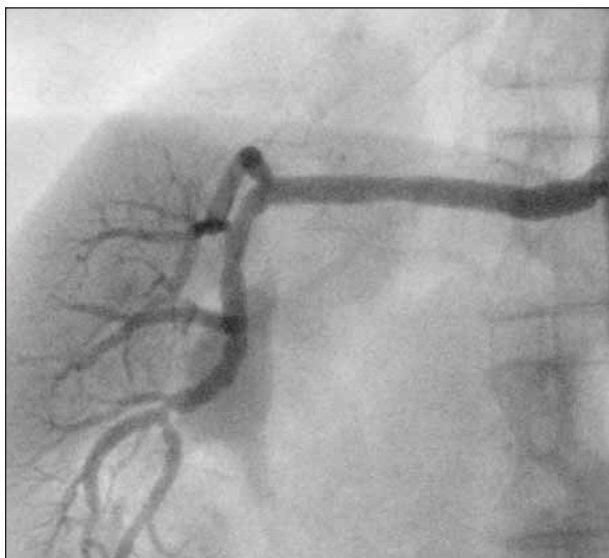


Figure 5. Anterior-posterior projection of the right renal arteriogram after successful exclusion of the aneurysmal sac.

cessful. A 90-cm, 5-F diagnostic IMA catheter was placed through the 8-F RDC guide into the aneurysmal sac for better directional control and wire placement into the superior-anterior branch (Figure 4). Then, the Wholey wire was successfully placed into the superior-anterior branch. The 5-F catheter was removed without difficulty.

A 5-mm X 38-mm iCast stent graft was placed onto the Wholey wire and positioned across the neck of the aneurysm and was deployed at 6 atm for 50 seconds. Final angiography demonstrated successful exclusion of the aneurysmal sac (Figure 5). Preprocedure and postprocedure angiography clearly demonstrated the loss of a posterior-inferior segment of the kidney. The patient tolerated the procedure without difficulty. The sheath was sutured in place and was ultimately removed when the activated clotting time was <150. The patient was administered 450 mg of clopidogrel after the procedure. Approximately 2 weeks after the procedure, the patient's serum creatinine was 0.8 mg/dL.

DISCUSSION

Current surgical therapy includes a variety of techniques. In one series, Henke et al reported their 35-year experience involving 121 patients with 168 renal artery aneurysms.⁵ Operative techniques included resection of the renal artery with angioplasty closure of the renal artery or reimplantation of the renal artery (63 patients), resection and renal artery reconstruction with renal artery bypass (33 patients), and planned nephrectomy (25 patients). Secondary nephrectomy was performed for early surgical failure (eight patients) as a result of nonreconstructable renal artery, thrombosis, or excessive

bleeding. With nearly 20% of patients undergoing surgical repair requiring nephrectomy, alternative methods for aneurysm treatment should be considered.

This case demonstrates the ability to exclude a renal artery aneurysms with an endovascular solution despite a previous failed attempt. Clearly, percutaneous intervention has found a role in the treatment of vascular disease. Compared to surgical intervention, it has a much lower risk modality when performed by skilled operators. Surgical intervention is associated with a larger risk, both periprocedurally as well as in the long-term, given the previously described 20% nephrectomy rates.

The long-term history of stent graft exclusion of renal artery aneurysm remains unknown, and clinicians, utilizing noninvasive imaging and laboratory studies to follow renal function, must perform careful outpatient monitoring.

Renal artery aneurysms may result in renovascular hypertension and significant morbidity and mortality. Previous cases of renal artery aneurysm exclusions have been reported, but this is the first documented case utilizing this new device.^{4,7,8} Percutaneous intervention is a safe and viable alternative to surgery and should be considered in those cases that meet the criteria for treatment. ■

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