Concomitant renal artery and aortic aneurysm: is endovascular surgery the correct approach?

Article Type: Case Report

Abstract: Our case illustrates the concomitant presence of a giant aneurysm of the left renal artery at the ostium and an abdominal aortic aneurysm, in presence of a complex aortic anatomy. Type of approach and timing of the treatment is still not well established for the rare coexistence of these two pathologies. Endovascular therapy in case of surgical high risk patient is considered now the best choice to exclude arterial and aortic aneurysms even though the chance to do further interventions in the follow-up.

For this reason we simultaneously treated both the aneurysms through an embolization with plugs and coils of renal aneurysm and endovascular exclusion of aortic aneurysm; in the follow-up renal function of the patient worsened until haemodialysis and we saw the reperfusion of renal aneurysm and the onset of endoleak I type A from above the aortic and renal aneurysm and B from iliac legs of the previous endograft. We performed a parallel graft technique on visceral vessels in order to exclude the refilling of both aneurysms and preserve visceral vascularization. Follow-up at 12 months showed the complete exclusion of the aneurysms and the patency of stents in celiac trunk and superior mesenteric artery.
Dear Editor,

it is an honour for me to send to your journal our case report titled “Concomitant renal artery and aortic aneurysm: is endovascular surgery the correct approach?”.

Although endovascular therapy has changed and improved the result of some challenging cases, sometimes about rare pathologies, endovascular treatment can not be the correct or complete approach for a good outcome.

We think that our experience could be helpful in literature in case of the rare condition of concomitant presence of both the aneurysms showing how can be the management of the pathology.

Hoping in an your revision, best regards

Alberto Settembrini
amsettembrini@gmail.com
Dear Editor,

I would like to thank the reviewer for the comments.

About first comment, patient was considered unfit for open surgery because he needed a supra mesenteric cross clamping with with the risk of an important visceral involvement and the patient’s general conditions were not such as to give good chances of success. Furthermore the patient was not particularly compliant so we decided to treat him under general anesthesia (we modified the paper on line 85).

The second question is interesting: we decided not to do a fenestrated EVAR because although the patient was asymptomatic the aneurysmal dilation had increased in a short time and we did not think we could wait for the custom made graft; furthermore we considered chimney technique not safe in this case for the risk of mobilization of the stent in renal artery and it was necessary to do a three vessels chimney causing a significant increase of the time of the intervention, increasing the risks for the patient. Otherwise, in our opinion, embolization of the aneurysm could be a definitive solution in such a patient.

Alberto Settembrini
amsettembrini@gmail.com
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1 UO Chirurgia Vascolare, Fondazione Ca’ Granda Ospedale Maggiore, Milano
2 Università degli Studi di Milano

No authors have conflict of interest

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*Manuscript with Marked Revisions*
ABSTRACT
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Isolated renal artery aneurysms (RAA) are rare with a reported prevalence of 0.01%-0.09% in autopsies series and from 0.3 to 9.7% in the general population undergoing to angiographic or tomographic studies. Risk factors for RRA development are fibromuscular dysplasia, atherosclerosis and vasculitis. RRA are usually asymptomatic, but their rupture can be life-threatening. It happens most frequently when RRA diameters are > 2cm or in pregnant women. Even much rare is the association of RAA with an abdominal aortic aneurysm (AAA) and literature provides only few anecdotal examples. Owing to their rare finding it is still debated which could be the best approach to treat both the aneurysms, if at once or in multiple steps. About the endovascular treatment of AAA, in case of complex aortic anatomies, in the last years new approaches have emerged making it possible also for thoraco-abdominal or pararenal aortic aneurysms. Parallel graft technique with standard devices allows to treat AAA without an adequate infrarenal sealing zone thanks to the releasing of covered stents into the renal and/or visceral arteries to maintain their patency. Our case illustrates the concomitant presence of a giant aneurysm of the left renal artery involving the ostium and AAA, in presence of a complex aortic anatomy.
CASE PRESENTATION

A 76-year-old caucasian man with a medical history included chronic renal disease with a right atrophic kidney presented at our Hospital with a 4 cm left RAA associated to a 4.8 cm saccular infrarenal AAA detected with abdomen duplex ultrasound. Both aneurysms were known and the patient was in follow-up since many years.

Patient’s medical history included also chronic obstructive pulmonary disease, hypertension and moderate aortic valve stenosis.

Computerized tomography angiogram (CTA) confirmed the presence of both left RAA and AAA. The left saccular RAA had a proximal wide neck and involved the ostium of the artery. The origins of superior mesenteric artery (SMA) and both renal arteries were at the same level and meanwhile the infrarenal AAA’s neck length was only 10 mm (Fig.1). Moreover, both aneurysm of both the femoral arteries were aneurysmatic with a diameter of 2.3 cm on the right and and 1.8 cm on the left respectively. Considering the high surgical risk, due to the fragile clinical conditions, and the need of a supra mesenteric cross clamping increasing the risk of life threatening complications, we deemed the patient unfit for open surgery and we planned for a combined endovascular aneurysm repair (EVAR) of the AAA and embolization of the left RAA. Under general anesthesia, we perform bilateral exposure of both the aneurysmatic femoral bifurcations preparatory to EVAR procedure and to their open surgical correction. Through a percutaneous left brachial access, we placed a 90 cm 7F introducer in the superior mesenteric artery to create a reference point. Left RAA was selectively catheterized with a J shaped 7F introducer and a 16 mm Amplatzer plug (Abbott, Chicago, USA) was deployed. Then, we deployed from the right side a bifurcated endograft Endurant 23-16-170 mm (Medtronic, Minneapolis, USA) and a left iliac branch and two coils 20 x 20 mm (Cook, Bloomington, USA) into the aneurysm’s sac. And lastly, both the femoral aneurysms were corrected by means the interposition of a PTFE 8 mm graft. At the completion angiography, we observed just a slow flow persistence in the RAA with a leaking between the lower portion of the plug and the lower rim of RAA neck. Considering the lengthy procedure, the impairment of the renal function and the fragile clinical picture we decided
not to proceed further monitoring the AAA with close radiologic checks. Control CTA at one month showed regular exclusion of both the aneurysms.

After 6 months, a new CTA showed a partial dislodgement of the plug with persisting reperfusion of RAA and a 5mm increase of RAA diameter with the persistent perfusion of sac (Fig.2). We deployed, after selective catheterization of the RAA, an adjunctive 14 mm Amplatzer plug and four coils obtaining the complete exclusion of arterial refilling at the final angiography. After this intervention, the patient went back to his hometown and was lost to follow-up for 4 years. In the meantime patient’s left renal function further worsened, necessitating the beginning of hemodialysis treatment. Last follow up with abdominal ultrasound revealed a further growth of AAA diameter. CTA reported a reperfusion of RAA together with a significant increase in AAA diameter up to 8.5 cm (Fig. 3). This was caused by the development of an aortic type Ia endoleak originating from above the right renal artery and a type Ib endoleak from the kinked left iliac limb. For all these reasons and considering the end stage renal failure we scheduled a treatment through a two-chimney technique on celiac trunk and SMA to exclude both aortic and renal aneurysms preserving at the same time the function of visceral vascularization. Under local anesthesia, via femoral and brachial access, we deployed a 7 x 37mm and 8 x 37 mm BeGraft stent graft (Bentley, Hechingen, Germany), respectively in the celiac trunk and the superior mesenteric artery. To complete the procedure, a 32 x 70 Endurant aortic cuff was then placed in the suprarenal position. To correct the iliac kinking of the limbs cause of aortic type IB endoleak, two further iliac branches of 16 mm on the left and 20 mm on the right side and 4 spirals were inserted. CTA after 1 month and duplex ultrasound after 6 and 12 months showed the complete exclusion of the AAA and left RAA with growth stopping (Fig.4).
DISCUSSION

RAAs are a rare occurrence, with an incidence of about 1%. Diagnosis is often made incidentally when the abdomen is imaged for other reasons. They are usually asymptomatic, but sometimes presentation symptoms can be high blood pressure, haematuria, back pain or decreased kidney function. Notably, their rupture can be a life-threatening emergency.

Due to their low incidence, the natural history and clinical relevance of RAA, are not completely elucidated. The combination of AAA and RAA is even rarer. It has been more frequently observed in the paediatric population while between adults only anecdotal cases have been reported with a particular localization at the origin of the renal artery.

Although controversial, recognised indication to their treatment are rupture, presence of symptoms and diameter greater than 2 cm or enlarging nature, pregnancy, renal embolization causing deteriorating renal function and portal hypertension scheduled for liver transplant uncontrolled hypertension.

Treatment options for RAA include open surgery (renal artery bypass graft, aneurismectomy, ex vivo repair, autotransplantation or nephrectomy), laparoscopic repair or endovascular procedures by means of selective or non-selective embolization, with afferent and efferent vessel preservation or aneurysm exclusion with covered stents.

While the approach to RAA is not universally shared, because its treatment is strictly dependent on location and anatomical features, being controversial and technically challenging the endovascular repair of AAAs is widely described and considered feasible even in complex anatomies thanks to the development of advanced endovascular procedure such as parallel grafts.

In the case here presented, we have initially chosen a separate but simultaneous endovascular treatment of the two aneurysms, by means of EVAR for the AAA and multiple plug and coil embolizations to exclude the RAA. This strategy was preferred because renal function was impaired but still stable. After the first embolization the decision, to monitoring the RRA and to continue.
towards endovascular treatments has been justified for the high surgical risk of the patient who would hardly have endured a suprarenal or supraceliac aortic cross clamping. The late reperfusion of RAA and aortic endoleak IA, due to the progression of the aortic disease with dilatation of the aortic neck, entail a significative risk of aneurysms growth and rupture and made mandatory a new treatment. Also the development of the endoleak IB is to be considered an important topic in the evolution of the aortic disease because this complication is definitely due to the progression of the disease and the remodeling of the aorta. Considering the progressive but inexorable worsening of renal function, requiring hemodialysis, the unfavourable anatomical features, namely the close origin of all visceral vessels to renal arteries, and poor general conditions, we decided to continue endovascular treatment way through a two vessel chimney technique targeted on visceral vessels. It is important to underline that the end stage renal failure allowed us to exclude completely the RAA performing a two vessel chimney.

For parallel stents technique to avoid gutters and to preserve visceral perfusion we have preferred balloon-expandable, PTFE-covered stents thanks to their high crushing resistance, high conformability, stability and predictable behaviour and foreshortening.
Conclusion

Treatment of concomitant AAA and RAA is still a challenge for the wide variability of anatomy. Total endovascular repair of both pathologies could be considered a real option also because all those treatments are repeatable, can be performed under local anaesthesia also in case of critical conditions, but it is mandatory a lifelong follow up to avoid unexpected and impressive growth of both the aneurysms. In our experience, concomitant endovascular treatment of AAA and RAA, through endovascular exclusion and coil embolizations, showed satisfying middle-term results despite that it requires a close monitoring and supplemental procedures.

Chimney technique has been successfully adopted for endovascular re-treatment because we considered it a feasible way to have more chances to reach a stable and long lasting system.
REFERENCES


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**Note**: Ruptured AAA RAA occasional finding

**FULL TEXT NOT AVAILABLE**
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Legends

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