

# Endovascular repair of a ruptured abdominal aortic aneurysm after endovascular aneurysm repair due type IB endoleak associated with a late fistula between the abdominal aorta and a retroaortic left renal vein

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## ABSTRACT

A ruptured abdominal aortic aneurysm after endovascular aneurysm repair with an arteriovenous fistula between the aneurysm sac and a retroaortic left renal vein is an extremely rare complication. This case describes an 81-year-old man who developed an aorto-left renal vein fistula owing to a type IB endoleak 2 years after endovascular aneurysm exclusion. The leak was repaired with a left endograft limb extension. Endovascular techniques are attractive and feasible alternatives and can play an essential role in reinterventions. This report is the first of an aorto-left renal vein fistula owing a type IB endoleak after an endovascular aneurysm repair. (*J Vasc Surg Cases and Innovative Techniques* 2020;6:629-32.)

**Keywords:** Abdominal aortic aneurysm; Endovascular repair; Complication; Arteriovenous fistula; Left renal vein; Aneurysm rupture; Stent graft

Ruptured abdominal aortic aneurysm (RAAA) after endovascular aneurysm repair (EVAR) is a rare complication that occurs around 1% per year (EUROSTAR study).<sup>1</sup> An AAA with spontaneous aorto-left renal vein fistula is an unusual but well-described clinical condition. It is commonly accompanied by abdominal pain, hematuria, and a nonfunctioning left kidney.<sup>2</sup> Even rarer, an arteriovenous fistula between the aneurysm sac and a retroaortic left renal vein (RLRV) after a AAA type III endoleak expansion has been described only once.<sup>3</sup> This report describes to a patient who developed an aorto-left renal vein fistula owing to a type IB endoleak 2 years after endovascular aneurysm exclusion. The leak was repaired with a left endograft limb extension. The patient provided written informed consent for publication.

## CASE REPORT

A 79-year-old man was referred to our service with a 7.5-cm AAA. His medical history included Parkinson disease,

diabetes mellitus, and past cigarette smoking. The aneurysm had favorable anatomical characteristics for endovascular treatment with a neck of 40° angulation and 21 mm in length, without any significant calcification or thrombus. Both iliac arteries were tortuous, but without interfering with performance of the procedure. No iliac aneurysms were observed. A single retroaortic left renal vein was noted on a preoperative computed tomography (CT) scan. The patient underwent elective EVAR using a bifurcated Treovance abdominal aortic stent-graft (Bolton Medical, Barcelona, Spain): 28-B1-28-100S with 28-L114-100S left iliac limb and 28-L1-17-120S right iliac limb. Intraoperative angiography showed an evident type IB endoleak from the right common iliac artery, entirely resolved with a 28-L1-14080S right iliac limb extension. The completion angiography confirmed satisfactory stent graft deployment and aneurysm exclusion (Fig 1). The patient had an uneventful postoperative recovery and was discharged after 2 days. A postoperative ultrasound examination did not show any endoleak. After discharge, the patient was lost follow-up.

Two years later, the patient returned to our service presenting with a 12-hour history of abdominal pain, hypotension, lower limb edema, and acute renal failure.

Examination revealed abdominal tenderness, a blood pressure of 90/60 mm Hg, and a pulse rate of 102 bpm. The serum levels were hemoglobin 11.1 g/L, serum creatinine 2.61 mg/dL, and estimated glomerular filtration rate 22.9 mL/min/1.73 m<sup>2</sup>. A CT scan revealed a 7.5-cm infrarenal AAA with evidence of extra-aortic rupture signs (retroperitoneal stranding on CT scan [Fig 2, A and B], along with acute anemia). In addition, there was a non-perfused enlarged left kidney and a retroaortic left renal

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**Fig 1.** Perioperative final angiography confirmed satisfactory deployment of the stent graft and exclusion of the aneurysm using a bifurcated Treovance abdominal aortic stent graft (Bolton Medical, Barcelona, Spain).

vein. The left gonadal vein was dilated, and there was early enhancement of the inferior vena cava (IVC) via the RLRV. This observation suggested the presence of an aorto-left renal vein arteriovenous fistula (ALRVAF) (Fig 2). The image suggested that one of the graft hooks might have penetrated the RLRV, possibly resulting in retroperitoneal leakage with consequent fistulization into the IVC.

The patient underwent a new EVAR and the initial aortography noted an insufficient sealing zone of the left endoprosthesis limb in the left common iliac artery, causing a type IB endoleak (Fig 3, A). Early enhancement of the IVC via RLRV was also evident, clearly showing the presence of an ALRVAF (Fig 3, B). At first, we deployed an Endurant II (Medtronic Minneapolis, Minn) ETCF 3232C49EE proximal aortic extension with the purpose of sealing the ALRVAF. However, this maneuver was unsuccessful. The type IB endoleak was then repaired with a left endograft limb extension: Endurant II (Medtronic) ETLW 1616C82EE and proximal aortic extension ETCF 3232C49EE. Final angiography confirmed satisfactory deployment of the stent grafts. The aneurysm sac was completely excluded, and there was no sign of ALRVAF (Fig 3, C). After endovascular management, renal function improved and the patient was discharged on postoperative day 2. A CT scan was not performed owing to renal function impairment. Therefore, an ultrasound examination was performed 1 month after the procedure, with no signs of endoleak or aneurysmal sac enlargement.

## DISCUSSION

RAAA after EVAR is a rare complication with an annual cumulative rupture rate of approximately 0.4% to 1.0%<sup>1,4</sup>

and an overall mortality of 57%.<sup>1</sup> Concerning the rupture cause, the preoperative aneurysm diameter and migration during follow-up correlated independently with post-EVAR aneurysm rupture.<sup>1</sup> In this case, the patient had a large aneurysm diameter (>7 cm), with a common iliac type IB endoleak, leading to aneurysmal sac pressurization and rupture. ALRVAF is a rare complication of AAA, first reported by Lord et al in 1964<sup>5</sup> and since then, around 30 other cases of ALRVAF have been described,<sup>6</sup> usually involving an anomalous RLRV.<sup>7</sup> However, only one report described a late complication of EVAR with an arteriovenous fistula between the aneurysm sac and a RLRV after a type III endoleak with AAA expansion.<sup>3</sup> To our knowledge, this work is the first report of ALRVAF owing to type a IB endoleak.

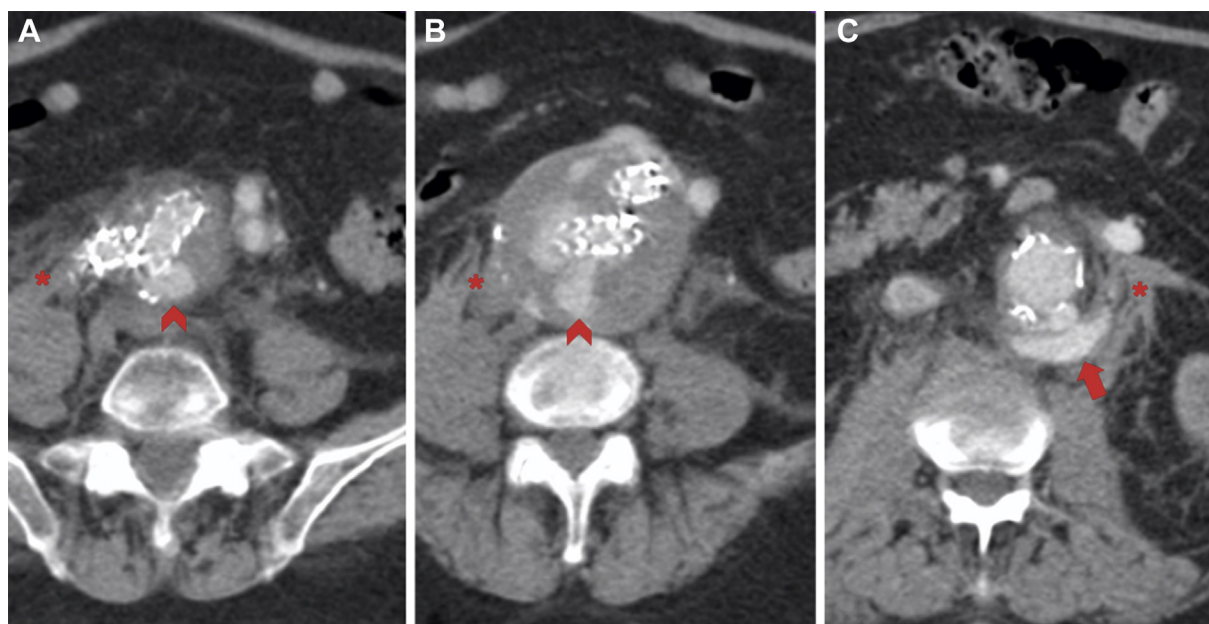
Recent studies on review of CT scans and cadaveric specimens estimate that the incidence of RLRV is 1.8% to 3.4%.<sup>7,8</sup> RLRV implies in an increased risk of venous injury and bleeding during abdominal aortic surgery, development of posterior nutcracker syndrome, and the possibility of ALRVAF formation.<sup>7,9</sup> Mansour et al<sup>10</sup> reported that 94% of the patients with ALRVAF had RLRV. It has been postulated that the perianeurysmal inflammation and venous wall compression-related necrosis between the pulsating aneurysm and the vertebral bodies, leading to vessel wall erosion and fistula formation.<sup>6-8,11</sup>

ALRVAF leads to arteriovenous shunting and reflux within the left renal vein, resulting in left kidney venous hypertension, which sometimes mimics a urologic condition. The presence of priapism among some patients with acute aortocaval fistula has also been described.<sup>11-13</sup> An ALRVAF may present with hematuria, renal impairment, abdominal, groin or left flank pain,<sup>6</sup> owing to the effect of venous hypertension in the left kidney. The clinical triad of pulsatile abdominal mass, hematuria, and continuous abdominal bruit is most suggestive of either ALRVAF or aortocaval fistula. Signs of cardiac failure or hemodynamic shock were present in less than 20% of the cases, possibly owing to shunt reduction because the RLRV is compressed between the vertebral bodies and the aneurysm.<sup>11</sup>

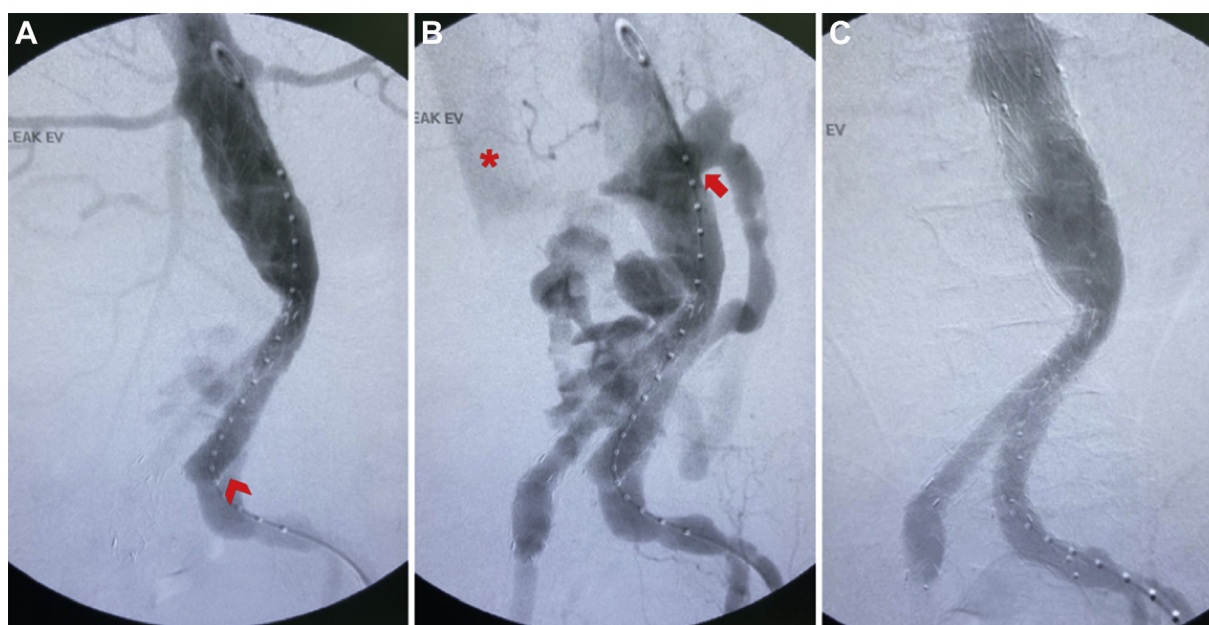
An unawareness of ALRVAF and the nonspecific clinical presentation may lead to a delayed diagnosis of this critical condition. A CT scan usually shows an enlarged, non-perfused left kidney (silent left kidney), along with distension and dense enhancement of the left renal vein tributaries. The diagnosis can be verified by demonstrating a communication between the aorta and RLRV.<sup>11</sup>

Owing to the retroperitoneal venous hypertension, a RAAA with an acute arteriovenous fistula is associated with a mortality rate that exceeds 70%. There is an increased risk of intraoperative bleeding and hemodynamic instability.<sup>14</sup>

Endovascular treatment is an attractive modality because it is minimally invasive and can provide rapid



**Fig 2.** Contrast-enhanced axial computed tomography (CT) slices. **A, B,** Dense contrast enhancement within aneurysm sac (*arrowheads*) and signs of ruptured abdominal aortic aneurysm (RAAA), with high-attenuation fluid located in the retroperitoneum suggestive of hematoma extending to the psoas muscle (\*). **C,** Early enhancement of retroaortic left renal vein (*arrow*), which suggests a fistula between the aberrant left renal vein and the abdominal aortic aneurysm.



**Fig 3.** Intraoperative digital subtraction angiogram. **A,** Leakage of contrast material adjacent to left iliac artery attachment site (*arrowheads*), consistent with a type IB endoleak. **B,** Early enhancement of the inferior vena cava (IVC) (\*) via a retroaortic left renal vein (*arrow*) and endoleak type IB (*arrowheads*), showing clearly the presence of an arteriovenous fistula between the aneurysm sac and the retroaortic left renal vein. **C,** Final angiography with satisfactory deployment of the stent graft, using Endurant II (Medtronic, Minneapolis, Minn), with the aneurysm sac completely excluded and no sign of the arteriovenous fistula.

percutaneous arterial access, graft deployment, and balloon occlusion for vascular control. This minimizes blood loss in comparison with open surgery.<sup>6,8</sup> Upon device deployment and fistula exclusion, an immediate

decrease in preload occurs, with concomitant reduction in renal vein congestion.<sup>14</sup>

The successful endovascular treatment of aortocaval fistulas or AAA rupture after EVAR has been reported, but

around only 30 cases ALRVAF were found in the literature,<sup>6</sup> and only one after EVAR.<sup>3</sup> Ferrari et al described an ALRVAF after sac expansion owing to a disconnection between the right iliac limb and an extender cuff. The follow-up CT scan showed neither evidence of ALRVAF or any complication related to the EVAR, and the aneurysm sac volume was decreased by approximately 50%.<sup>3</sup> In our case, the endovascular procedure completely excluded aneurysm sac and no signs of ALRVAF were detected.

## CONCLUSIONS

ALRVAF owing RAAA after EVAR is an extremely rare complication. The preoperative diagnosis can be accomplished with careful interpretation of CT scans that gives fast and precise information. Endovascular techniques are attractive and feasible alternatives and can play an important role in these scenarios if anatomically and hemodynamically suitable. This case is the second reported complete endovascular treatment of ALRVAF after EVAR with successful exclusion and subsequent closure of the ALRVF and the first report of RAAA with ALRVAF after EVAR owing type IB endoleak.

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