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A Late Post-EVAR Rupture in a 102-Year-Old Patient Related to a Type II Endoleak

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Abstract

Purpose: Endovascular abdominal aortic aneurysm repair (EVAR) is progressively being applied in the elderly population. Type II endoleaks are common and mostly benign, but they are related to more aneurysm sac expansion after EVAR. They may lead to rupture in <1% of cases. We present a case of a centenarian with a post-EVAR rupture, related to type II endoleak, and discuss the use of EVAR on the management of this type of endoleak in an extremely old patient. **Case Presentation:** A 102-year-old man with a history of EVAR 12 years earlier, presented to the emergency department with a drop of consciousness. A computed tomography revealed a ruptured abdominal aortic aneurysm. Angiography showed a type II endoleak related to patent lumbar arteries deriving from collateral branches of the right internal iliac artery. Embolization was not successful and subsequently the ostium of the iliolumbar artery was overstented, obliterating the feeding branch. The postoperative course was complicated by a deterioration of chronic obstructive pulmonary disease and patient was discharged home on the seventh postprocedural day; nonetheless, he died on postoperative day sixteenth due to respiratory complications. **Conclusion:** Complications following EVAR are a real threat and emphasize the need for follow-up. The current case report shows that age per se should not be a contraindication for EVAR nor for follow-up. Also, late ruptures due to type II endoleaks could be treated in the very elderly population although larger series are required for robust conclusions.

Keywords

centenarian, type II endoleak, EVAR, rupture, rAAA

Introduction

Elective endovascular abdominal aortic aneurysm repair (EVAR) is recommended for most patients with suitable anatomy and reasonable life expectancy as the preferred treatment modality.[1] The European Society for Vascular Surgery guidelines suggested a pragmatic definition of reasonable life expectancy being >2 to 3 years and <10 to 15 years.[2] Seventy-five percent of patients requiring elective abdominal aortic aneurysm (AAA) repair are treated by an endovascular approach related to a decreased early mortality, complications, and length of hospital stay, compared to open repair.[1,3]

The US Census estimates the >85 years group will more than triple in size over the next decades.[4] The prevalence of AAAs increases with age. As the population ages with improvements in medical care, more elderly patients will present with an AAA.[5] There are many studies suggesting that EVAR in octogenarians is feasible and safe, with technical success rates up to 99.3%, but with a lower remaining health status at 1-year, compared to a younger population.[6] Only few studies and scarce case reports have reported successful management of nonagenarians and centenarians with AAA using EVAR, making it difficult to suggest the right conduct on this group of very old patients.[5]

Reintervention for complications after EVAR, such as endoleaks, is performed in about 20% of cases.[7] Type II endoleaks (TIIELs) are the most frequent type of them, with some studies reporting rates as high as 29%, and others as low as 6.3% of the patients treated by EVAR.[8] Type II endoleaks are often benign but have been associated with a higher incidence of aneurysm growth and more secondary endovascular procedures.[9] Rupture due to TIIEL is only rarely reported, accounting for less than 1% of all TIIELs.[10]

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Almost 10 years ago, Lath et al[11] published the oldest reported case of an AAA treated at that time, describing a 101-year-old female who was successfully operated by an open repair for a symptomatic 9-cm AAA. Recently, Nishi et al[12] reported a 103-year-old male patient with a ruptured AAA successfully treated with EVAR. Herein, we report a case of a 102-year-old male patient with a history of EVAR, with a secondary rupture AAA related to TIIEL, converting it to our knowledge, in the second oldest patient, treated for an AAA and the first centenarian patient treated for a ruptured aortic aneurysm related to a TIIEL.

Case Presentation

A 102-year-old male patient with mild dementia but capable of carrying out his daily life activities with independence was brought to emergency department with diaphoresis, respiratory failure, and drop of consciousness. His clinical history included Global Initiative for Obstructive Lung Disease GOLD 3 chronic obstructive pulmonary disease (COPD), atrial fibrillation under treatment with low-dose rivaroxaban (2.5 mg twice a day), and EVAR for a AAA 12 years before, when he was 90 years old, using a Talent bifurcated stent-graft (Medtronic) in another hospital. He never underwent any follow-up imaging since EVAR for unknown reasons. At admission, he had a heart rate of 110/min, a mean arterial blood pressure of 60 mm Hg and a blood oxygen saturation of 95%. Laboratories showed hemoglobin of 7.6 g/dL, white blood count of 27 000 $\times$ 10^3/μL, and creatinine levels of 1.8 mg/dL. Transfusion of 2 units of blood was given. A computed tomography (CT) scan without iodine contrast revealed a ruptured AAA sac of 12 cm $\times$ 9.5 cm $\times$ 8 cm with free intra-abdominal fluid and retroperitoneal hematoma (Figure 1).

After careful consideration and informed consent, a reintervention was performed. At the hybrid room an ultrasound-guided percutaneous approach of the right common femoral artery was made under local anesthesia and a 6F introducer was placed. A CO^2 aortography showed a correct position of the endograft without evidence of migration. There was no type Ia, Ib, or type III endoleak observed, also not on angiographies using iodine contrast in different angles. A TIIEL, however, was observed on the lateral view using both iodine contrast and CO^2 angiography (Figure 2).

This TIIEL was related to 2 patent lumbar arteries deriving from the iliolumbar artery, originated from the right internal iliac artery (IIA; Figure 3). Selective catheterization of these branches was performed and they were embolized with Onyx (Medtronic). Nevertheless, a persistent outflow from this branch was still feeding the aneurysmal sac, a 7 $\times$ 29 mm BeGraft (Bentley) was deployed on the right IIA, occluding the ostium of the iliolumbar artery. Completion angiographies, performed with both iodine and CO^2 contrast, did not show persistence of any type of endoleak (Figure 4A and B). The femoral artery was closed using a ProGlide device (Abbott Laboratories).

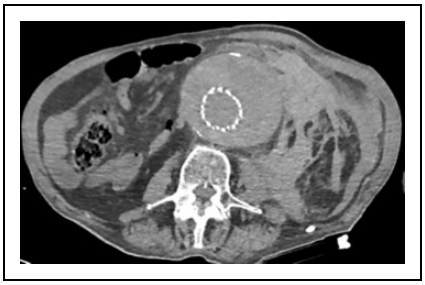

Figure 1. Computed tomography (CT) scan axial view. Rupture abdominal aortic aneurysm (AAA).

Figure 2. CO^2 lateral angiogram. Black arrow showing type II endoleak. Red arrow showing feeding vessel.

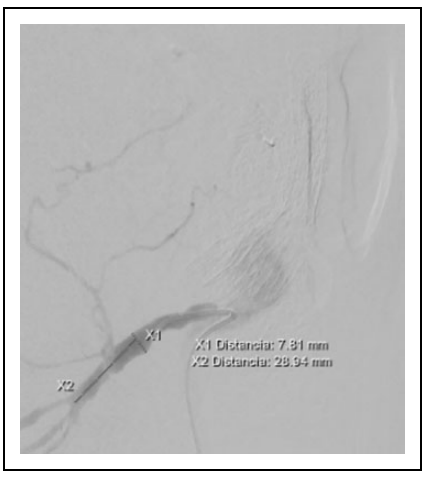

Figure 3. Digital subtraction angiography using iodine contrast material showing a branch of iliolumbar artery feeding the aneurysm sac.

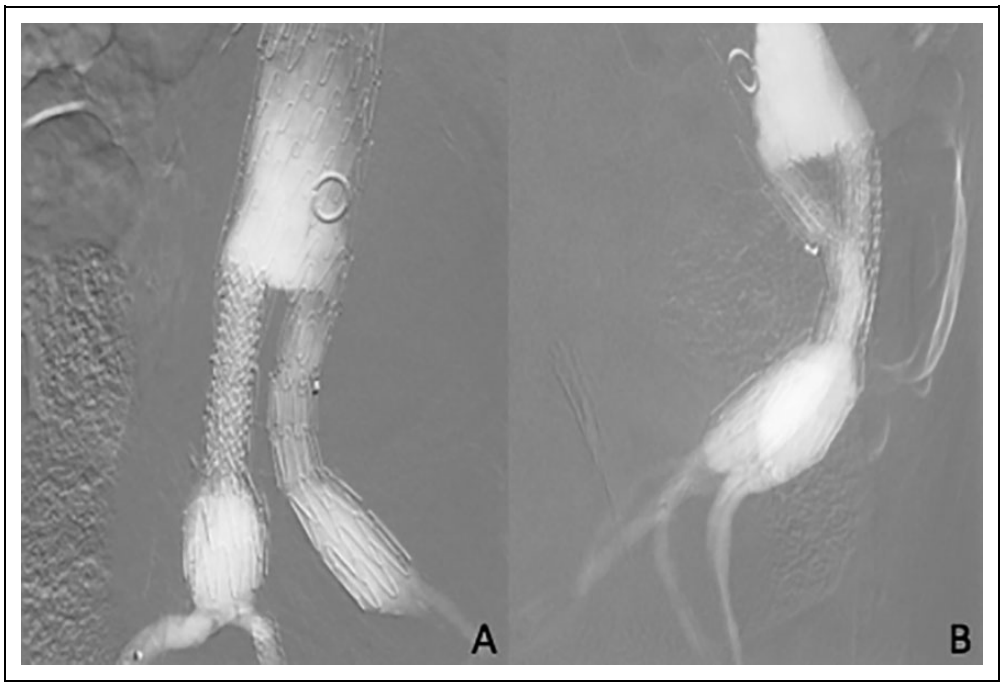

Figure 4. CO^2 angiogram showing sealing of the endoleak. (A) Anteroposterior view (B) Lateral view.

After the procedure, the patient remained stable. On the second postoperative day, a duplex ultrasound did not show a persistence of TIIEL. A control CT angiography was not performed in the early postoperative phase, because of the risk of further renal impairment. As a consequence of deterioration of his COPD, the patient remained in hospital until the seventh postoperative day. During this period, he received intravenous antibiotic treatment, kinetic rehabilitation and O^2 as required to maintain a O^2 saturation >90%. COVID-19 test was negative. Patient returned home with specialized respiratory care. At discharged, the exacerbation of COPD had resolved with an oxygen saturation of >90% without supplementary O^2, and a respiratory rate of 15 breaths per minute. He had no renal function impairment. Unfortunately, patient died on the sixteenth postprocedural day in his home situation due to respiratory insufficiency, according to his home care physician. There were no signs of abdominal pain suggesting EVAR complications.

Discussion

Over the past 30 years, EVAR has arisen as the new standard of care in the management of the majority of infrarenal nonruptured and ruptured AAAs.[13] Advancements in EVAR, and its wide application, have demonstrated compelling trends in decreasing AAA-related morbidity and mortality.[8] However, reintervention rates due to complications following EVAR are persistent, with endoleak being a significant set of them.[13] Type II endoleak represents retrograde bleeding into the aneurysm sac, most commonly from lumbar arteries, the inferior mesenteric artery, or other collateral vessels.[1] They resolve spontaneously within 6 to 12 months in about 80% of the cases, but some will later present with a type I endoleak, resulting in a high secondary intervention rate and significant risk of aneurysm-related complications.[9,14] Therefore, close follow-up of all patients after EVAR is mandatory. Treatment of TIIEL should only be considered if the patient is symptomatic or when presenting with sac growth >10 mm.[2] On a systematic review of Sidloff et al,[15] 0.9% of all TIEELs ruptured, but over one-third of these ruptures did not have concurrent sac expansion. Furthermore, in the ENGAGE registry, the incidence of isolated TIIELs was 15.6% and only 2 of the 197 patients in this group eventually presented with a rupture, confirming that a rupture AAA caused by a TIIEL is extremely rare.[9]

Our patient, with an EVAR previously performed in another institution, never underwent any kind of image follow-up for unknown reasons. Potentially, his old age at time of treatment could have played a role. The family referred that he never received any follow-up indication. Therefore, the time of occurrence and the rate of sac growth are unknown. Likely, we would have treated the patient earlier if we had encountered a significant sac growth during surveillance.

Minimization of iodinated contrast is essential when performing EVAR on patients with a high risk of developing contrast-induced nephropathy. This grave complication is the third leading cause of hospital-acquired renal failure, carrying a several-fold increase in short-term and long-term mortality. Established risk factors for contrast-induced renal injury include preexisting renal insufficiency, diabetes mellitus, dehydration, cardiovascular, smokers, and advanced age (>75 years). In our institution, CO_2 is part of common clinical practice and in this particular patient, the high age was an argument to use CO_2, and consequently reduce the volume of iodine contrast, avoiding renal injury.[16]

Table 1. Studies Involving EVAR on Nonagenarians.[a]

Author	Number of patients	Mean age (years)	Mean AAA size (mm)	30-day morbidity rate (%)	30-day mortality rate (%)	Endoleaks	Reintervention rate (%)
Baril et al[21]	16[b] 2[c]	92.4	73.0	38.8	11.0	I (2) II(2)	17.0
Geisbüsch et al[23]	27[b]	91.6	71.0	14.8	0	I (1) II (2) IV (3)	11.0
Goldstein et al[19]	24[b]	91.5	63.0	25.0	4.2	I (1) II (3)	4.2
Jim et al[4]	16[b] 2[c]	91.2	68	17	5.6	I (1) II (6) III (1)	11.1
Prenner et al[20]	24[b]	91.5	68	25	8.3	I (1) unknown (2)	12.5
Zhang et al[22]	10[b] 2[c]	92.5	67.3	58.3	8.3	I (2) II (5)	16.6
Lee et al[24]	15[b]	90.3	64	33.3	0	I (4) II (9)	27

Abbreviations: AAA, abdominal aortic aneurysm; EVAR, endovascular abdominal aortic aneurysm repair.
[a]We excluded studies with less than 10 patients, and where variables and outcomes of nonagenarian's weren't separated from those of octogenarians.
[b]No rupture AAA.
[c]Rupture AAA.

Table 2. Case Reports of Centenarian Patients Treated for Abdominal Aortic Aneurysms.

Author/year	Patient	Diagnosis	Treatment	Outcome
Lath et al[11]	101-year-old female	9 AM symptomatic AAA	Open repair	Lost to follow-up at 11 months after surgery
Nishi et al[12]	103-year-old male	Rupture AAA	EVAR	2 months follow-up, with a good outcome
Present study	102-year-old male	Rupture AAA post-EVAR due to TIIEL	Treatment of type II endoleak	Died on 16 POD due to respiratory complications

Abbreviations: AAA, abdominal aortic aneurysm; EVAR, endovascular aortic repair; POD, postoperative day; TIIEL, type II endoleak.

The landmark randomized controlled trials have demonstrated the early mortality benefit of EVAR over open surgery in patients <80 years old.[2] Furthermore, there are many reports with large numbers of patients suggesting that EVAR in octogenarians is safe and effective.[17] Nonetheless, data on nonagenarians are scarce and centenarians even more rare.[11,12] Tsimlimparis et al[18] compared different age groups of patients treated for AAA. They reported in nonagenarians group an overall 30-day mortality rate of 13.2% with a 5.5% mortality rate in the elective procedures. In the octogenarians, these rates were, respectively, 7.2% and 3.1%. Goldstein et al[19] and Prenner et al[20] reported 2 cohorts of nonagenarians undergoing elective EVAR consisting of 24 patients each. The former, with no AAA-related deaths within the 30-day postoperative period, and with cumulative estimated 12-, 24-, and 36-month survival rates of 83%, 64%, and 50%, respectively. The latter, with a perioperative mortality rate of 8.3%, clinical success rate of 79.2% at 30 days, and freedom from AAA-related mortality of 87.5% at 1 year, and of 73.2% at 5 years. Jim et al[4] published another nonagenarian series of 18 patients, with mortality rates of 5.6% at 30 days, 41.2% at 1 year, and 58.3% at 2 years. All of them concluded that EVAR is safe in this group of patients and that age should not be a contraindication for EVAR. Others nonagenarian's studies have reported similar results.[19,21,22] Table 1 summarizes studies of nonagenarians undergoing EVAR.

Shan et al[25] reported that Quality of Life on patients >80 years after EVAR, takes longer to recover compared with younger patients, and physical health domains recover more slowly than mental health domains. Pol et al[6] showed that recovery in QOL and the domains of mobility, self-care, and usual activities are delayed longer than expected on patients >80 years old. Our patient, underwent EVAR when he was 90 years old and survived 12 years without any known complications, referring he was satisfied with his physical and mental state during the last years.

This is the third centenarian patient with a known treatment for AAA (Table 2). The natural history of TIIEL has been recognized as predominantly benign, and close surveillance in growing aneurysms with persistent TIIEL is mandatory. Advanced age should not be a contraindication for AAA treatment. Future studies are needed to dictate behavior regarding this challenging group of patients, since with the increase in life expectancy, we will face more emergent procedures on centenary patients. Late ruptures due to TIIEL could be treated also in the very elderly population although larger series are required in order to draw robust conclusions. Decision-making in these very old patients remains complex and should always be based on shared decision-making after discussing both interventional and noninterventional options.

Authors' Note

Informed consent has been obtained from the patient's family for publication of the case report and accompanying image.

Declaration of Conflicting Interests

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