Complex thoracoabdominal aortic aneurysm – EVAR with renovisceral revascularization

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History

A 64-year-old male patient, with a 5-year history of uncontrolled hypertension, came to the hospital due to progressive chest tightness and shortness of breath over the past two months. A contrast enhanced CT chest and abdomen examination revealed a complex thoracoabdominal aortic aneurysm (TAAA, Crawford type III) with mural thrombi, extending to the bilateral common iliac arteries (CIA). Subsequently, the patient successfully underwent an endovascular aneurysm repair (EVAR) with renovisceral revascularization. A follow-up CT angiography (CTA) was performed to evaluate the patency of the stent-grafts and to rule out any endoleaks.

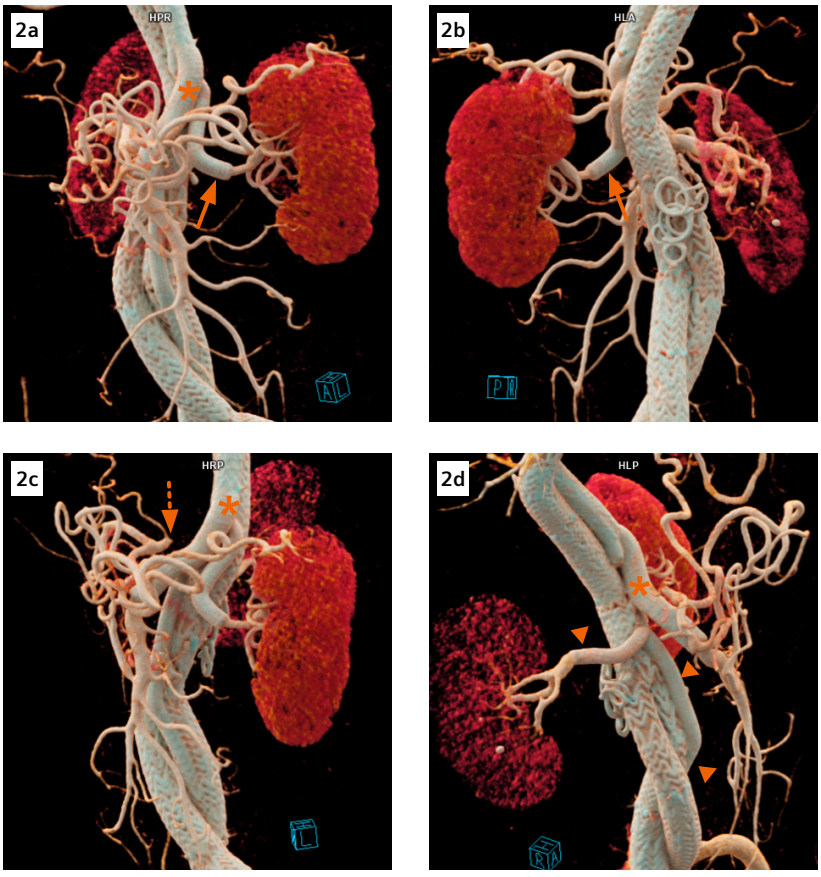
Diagnosis

CT images showed multiple stent-grafts placed in the thoracoabdominal aorta and bilateral iliac arteries, using the "octopus technique". The graft to the right renal artery (RRA), using the "periscope technique", came off the right iliac stent-graft, coursing retrogradely. The grafts to the left renal artery (LRA) and the superior mesenteric artery (SMA) branched off the left leg of the bifurcated abdominal stent-graft, with the former coursing posteriorly to the latter, here carried out with the "chimney technique". All stent-grafts were patent, and the distal vessels were opacified. The celiac artery (CA) was proximally occluded and supplied by collaterals from the SMA. A small aneurysm, with calcified plaques at the aortic isthmus, was seen without noticeable changes pre- and post EVAR. No signs of endoleaks were present.

Comments

AAAs are mostly asymptomatic and found incidentally – they are silent until they rupture, causing one of the most dramatic emergencies in medicine. [1] Complex aneurysms, including TAAAs, often require renovisceral revascularization using special endograft techniques, such as octopus, periscope and chimney, to reconstruct the renovisceral arteries. CTA is used to evaluate the aneurysm with comprehensive anatomical details of the renovisceral and iliac arteries, providing essential information in tailoring stent-grafts for endovascular treatment. It also plays an important role in monitoring the size of the aneurysm and assessing the stent-graft patency following EVAR. In this case, a unique scanning technique, the Turbo Flash mode, is applied. This uses a large pitch to obtain an ultrafast scanning speed. A range of 815 mm, depicting the complete aorta, is acquired in just 1 s in free breathing, achieving optimal image quality. A lower kV setting of 90 kV is applied to improve the contrast-to-noise ratio, reducing the radiation exposure and the amount of contrast agent needed. For image demonstration, an advanced cinematic volume rendering technique (cVRT)

is used, enabling a better 3D perspective with improved depth and shape perceptions. This is greatly appreciated by the patient and the interventionists, and ultimately eases communication. ●



1 **cVRT images show a complex TAAA extending into bilateral CIAs (Fig. 1a) and a post EVAR overview, using the "octopus technique" (Fig, 1b).**

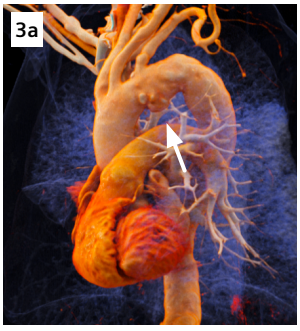
2 **cVRT images show the details of the stent-grafts in the renovisceral arteries. The grafts to the LRA (arrows) and to the SMA (asterisk) branch off the left leg of the bifurcated abdominal stent-graft, with the former coursing posteriorly to the latter, using the "chimney technique". The graft to the RRA (arrowheads) is coming off the right iliac stent-graft, coursing retrogradely, using the "periscope technique". All stent-grafts are patent and the distal vessels are opacified. The CA (dotted arrow) is proximally occluded and supplied by collaterals from the SMA.**

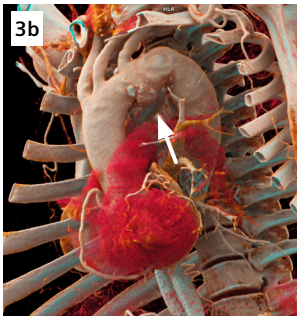
3 **cVRT images show a small aneurysm (arrows), with calcified plaques at the aortic isthmus, without noticeable changes pre- (Fig. 3a) and post (Fig. 3b) EVAR.**

Examination Protocol

Scanner	SOMATOM Force
Scan area	Trunk
Scan mode	Turbo Flash mode
Scan length	814.8 mm
Scan direction	Cranio-caudal
Scan time	1.0 s
Tube voltage	90 kV
Effective mAs	111 mAs
Dose modulation	CARE Dose4D
$CTDI_{vol}$	3.2 mGy
DLP	276.8 mGy*cm
Rotation time	0.25 s
Pitch	3.2
Slice collimation	192 x 0.6 mm
Slice width	1.0 mm
Reconstruction increment	0.3 mm
Reconstruction kernel	Br40

Contrast	350 mg/mL
Volume	45 mL + 40 mL saline
Flow rate	4 mL/s
Start delay	Bolus tracking with 100 HU at the renal artery level in the descending aorta + 6 s





References
[1] S Aggarwal, A Qamar, V Sharma, A Sharma. Abdominal aortic aneurysm: A comprehensive review. Exp Clin Cardiol 2011;16(1):11–15.

The statements by Siemens Healthineers' customers described herein are based on results that were achieved in the customer's unique setting. Because there is no "typical" hospital and many variables exist (e.g., hospital size, case mix, level of IT and/or automation adoption) there can be no guarantee that other customers will achieve the same results.