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Billowing Of Endologix Powerlink Stent Mimicking Endoleaks

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Abstract

Introduction: Endoleaks remains one of the primary concerns of endovascular aortic aneurysm repair (EVAR) and is routinely followed with CT angiography (CTA). However, certain imaging findings can mimic endoleaks.
Case Presentation: A 65-year-old woman who had endovascular aortic repair (EVAR) of an abdominal aortic aneurysm with Endologix Powerlink system developed marked new circumferential cauliflower-like bulging of contrast-filled sacs at mid-stent-graft with enlargement of the excluded aneurysm at 3-year follow-up.
Conclusions: Considering the unique construct of the Powerlink stents, this is thought to represent aneurysmal degeneration of the outer fabric material from the metal struts and may potentially pressurize the excluded sac with risk for rupture.

Keywords: Powerlink, Endologix, Endoleak, Billowing

1. Introduction

With increasing use of endovascular techniques for abdominal aortic aneurysm (AAA) repairs, the prevalence of vascular leakage into the excluded aneurysm sac or endoleaks as a complication has risen. Computer tomography angiography (CTA) is used in patients for routine post-placement follow up and thus plays an important role in detecting endoleaks (1). However, there are imaging findings that can mimic endoleaks and may require interventions. We recently encountered a case of an unusual imaging appearance of the fabric materials "bulging" far beyond the metallic struts in a Powerlink stentgraft (Endologix, Inc. Irvine, Calif) during a routine follow up CTA, mimicking a Type III endoleak.

2. Case Presentation

An asymptomatic 65-year-old woman with atherosclerosis and an infrarenal AAA extending just superior to the bifurcation with a maximal transverse diameter of 4.7 × 4.6 cm had increased to 5.1 × 4.7 cm at 3-month follow up. The aneurysm neck length was 32 mm and the neck diameter was 23 mm with an angulation of 56°. She had undergone endovascular repair with Powerlink system. The procedure itself was uneventful. The immediate post-operative follow up CTA of the abdomen and pelvis demonstrated a normal appearance of an infrarenal aortoiliac stentgraft (Figure 1) with maximal diameters of 5.1 × 4.8 cm. There was no evidence of endoleak, kinking or fracturing of the graft.

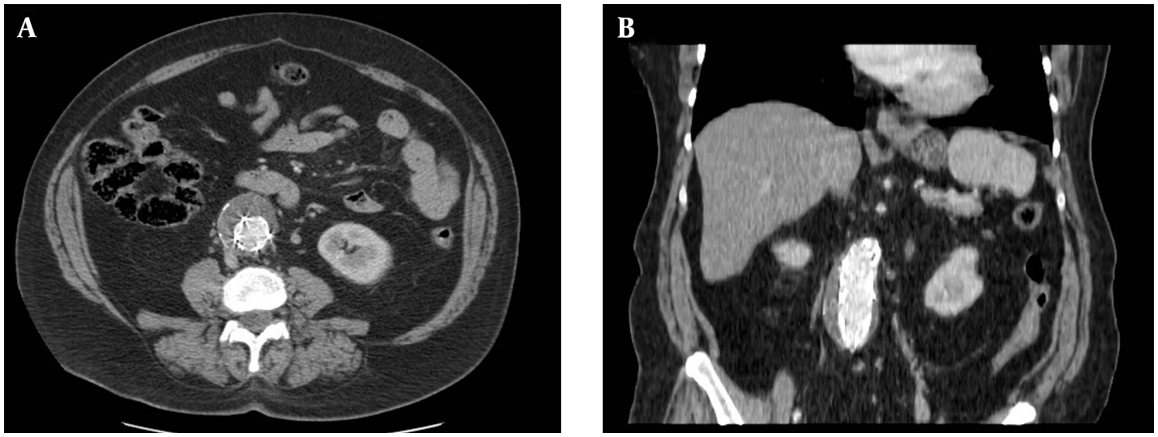

Figure 1. A, Axial and B, coronal slices of CTA of the abdomen with contrast at the level of the infrarenal aorta during the immediate post-operative period demonstrate stable and normal appearance of an aortic stentgraft; no evidence of endoleaks, kink or fracture.

Patient returned for imaging follow-up 3 years after the initial endograft placement. CTA of the abdomen and pelvis demonstrated the aneurysm diameters had increased from 5.1 × 4.8 cm to 5.6 × 5.6 cm with interval development of multiple contained sacs of contrast accumulations in between the metal struts in a circumferential fashion, which abutted the excluded aneurysm wall from the mid segment of the stentgraft (Figure 2). The 3D rendering reconstructed from the CT demonstrated cauliflower-like contrast filled sacs outside of the metal struts at mid to distal stentgraft mimicking that of a Type III endoleak (Figure 3). While the outer margins of these bulging sacs extended to the wall of the excluded aneurysm, the bulging sacs were not interconnected. There was no extra stent contrast filling between the sacs. This suggested confined contrast materials within the outer fabric material of the stentgraft with interval increase in size of the excluded aneurysm sac. The patient was asymptomatic and was treated similar to that of an endoleak with endovascular insertion of an overlying stent.

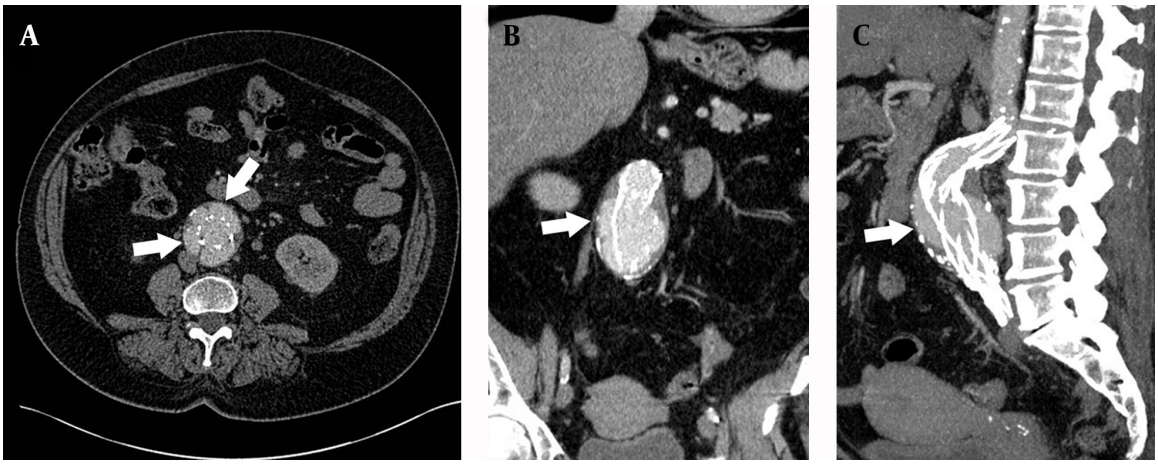

Figure 2. A, Axial; B, coronal and C, sagittal CTA of the abdomen and pelvis with contrast at the level of infrarenal aorta at 3 year follow up demonstrate interval aneurysm enlargement with circumferential contrast filled sacs (arrows) beyond the boarder of metal struts of the stentgraft in a cauliflower fashion. Note that there was no extrastent contrast filling between sacs or endoleak.

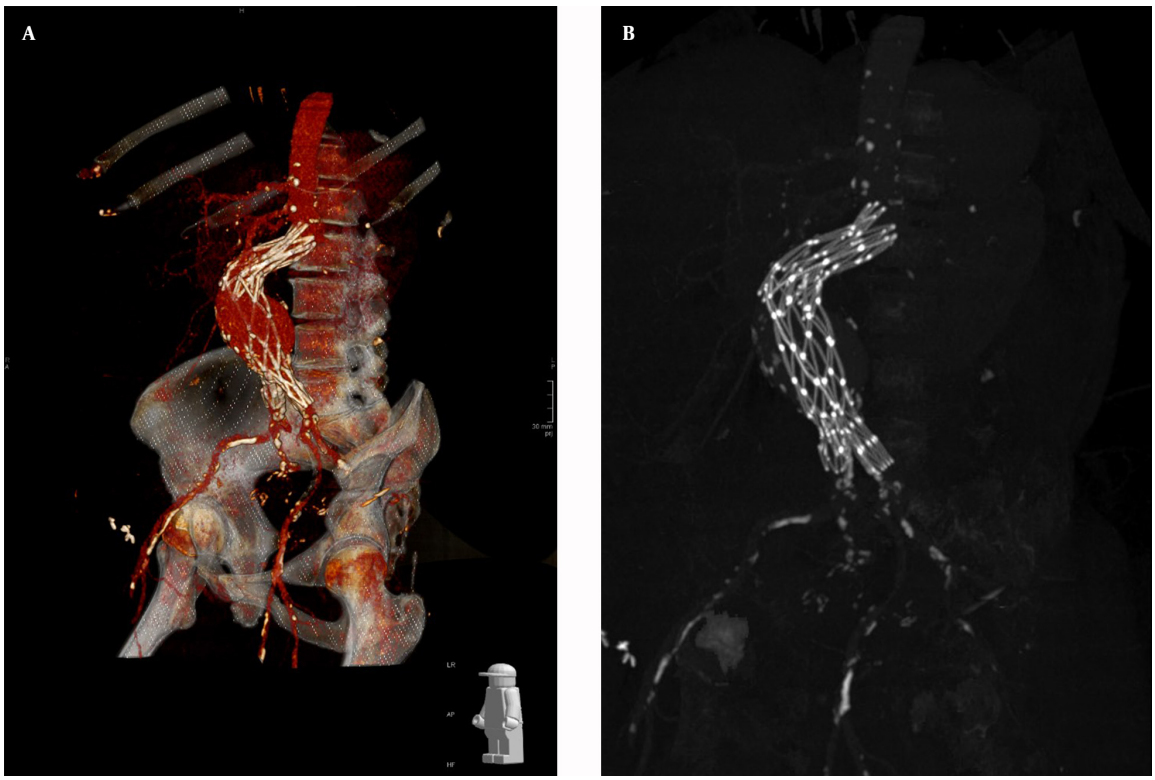

Figure 3. A, 3D rendering and B, maximal intensity projection of the Powerlink aortic stentgraft in situ reconstructed from the CTA demonstrate contrast filled sacs about the mid segment of the stentgraft.

3. Discussion

Endoleaks continue to be one of main concerns in endovascular aneurysm repair (EVAR) because pulsatile blood can pressurize the thinned aneurysm sac and may lead to aneurysm rupture. However, in the literature, it has been demonstrated that certain imaging findings can mimic endoleaks on post-procedural CT scans. For example, "pseudoendoleak" occurs when contrast media becomes trapped in the aneurysm sac during endovascular aneurysm repairs (2). This has characteristic findings of extrastent contrast seen on the non-contrast CT without extrastent flow on the Doppler ultrasound. “Billowing” is another phenomenon described by Armerding et al. in a post EVAR patient with an Endologix stentgraft for thoracic aortic aneurysm, where the CT demonstrated contrast beyond the border of the metallic endoskeleton (3). A similar case was reported by Hanley et al. where billowing is identified on the immediate post-procedural CTA in a patient who had undergone AAA repair with AFX Endologix stentgraft (4).

“Billowing” is thought to be unique for Endologix stentgraft, which is consisted of an inner cobalt chromium alloy self-expanding metallic endoskeleton with multiple metallic struts covered by a thin-walled, low porosity polytetrafluoroethylene graft fabric outer cover (ePTFE). The outer cover is secured to the metallic endoskeleton with polypropylene sutures only at the proximal and distal ends. This leaves potential spaces between the metallic endoskeleton and the outer fabric cover in the rest of the stentgraft and may allow blood and contrast material to flow in this space. Because of the construct of Powerlink system, the imaging appearance of circumferential ballooning of the Powerlink bifurcated stentgraft is thought to represent aneurysmal degeneration of the outer fabric material and manifested as bulging sacs of contained contrast accumulations due to loosening or weakening of the fabric material between the metal struts. In this patient, these bulging sacs abutted the margins of the excluded sac with interval enlargement of the treated AAA. The concern for billowing was that aneurysmal degeneration and bulging of the fabric material may pressurize the excluded sac similar to that of an endoleak and had potential for rupture. The patient was managed by the vascular interventionalist with endovascular treatment by deploying an overlying stent. The patient remained asymptomatic to date, a year later.

In true endoleaks, pulsatile blood accumulates on the outside of the stentgraft extending into the excluded aneurysm sac, which can pressurize the weakened endothelium with risks for rupture. Contrary to endoleaks, billowing is unique to the Endologix Powerlink system and thought to be due to aneurysmal degeneration of the outer fabric. In this case, interval enlargement of AAA with bulging stentgraft abutting the aneurysm sac raised concerns for possible pressurizing the already thinned and weakened aortic wall. We reported this case of unusual imaging appearance of Powerlink stentgraft to offer a novel explanation for the imaging finding. However, the true long term device safety profile calls for future studies with large cohorts.

Footnote

Authors’ Contribution: Study concept and design: Alex Wu, Karunakaravel Karuppasamy, Weiping Wang; analysis and interpretation of data: Alex Wu, Karunakaravel Karuppasamy, Weiping Wang; drafting of the manuscript: Alex Wu, Karunakaravel Karuppasamy, Weiping Wang; critical revisions of the manuscript for important intellectual contents; Alex Wu, Karunakaravel Karuppasamy, Weiping Wang.

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