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# **An aortic arch stentgraft implantation due to endovascular leak as the fourth aortic intervention in a challenging patient**

**Short title:** An aortic arch stentgraft implantation due to endovascular leak

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We present a 69-year-old female, former tobacco smoker, with hypertension, diabetes, and a history of aortic aneurysm, qualified to a novel procedure of branched aortic arch stentgraft implantation, as her fourth intervention on the aorta.

She underwent a supracoronary ascending aorta replacement due to a large aneurysm (70 mm) and a right lung upper lobe resection due to lung planocellular cancer four years before. After a year, a thoracoabdominal stentgraft with visceral branches was implanted, followed by the thoracic stentgraft below the left subclavian artery due to aortic aneurysm (**Figure 1A**).

Due to type IA endoleak, which occurred at the proximal end of the graft and resulted in a persistent flow into the sac of the thoracic aneurysm (**Figure 1B**) the patient was qualified for another intervention, involving the implantation of a special stentgraft with a branch to the brachiocephalic trunk.

An occlusion of the inflow towards the left common carotid artery and the left subclavian artery after implantation would lead to stroke and ischemia of the left upper limb, therefore the patient underwent a carotid-carotid-subclavian bypass, one month before the procedure.

However, due to a transient left-sided chest pain and exertional dyspnea, it was necessary to extend cardiac diagnostics. Fortunately, resting electrocardiogram did not reveal ischemic changes, and troponin levels were not increased. Transthoracic echocardiography revealed a proper function of the aortic valve, normal flow in the ascending aorta graft (Figure 1C, Supplementary material, *Video S1*) and aortic arch, and normal left ventricular ejection fraction (60%). Gated-single-photon emission computed tomography with dipyridamole confirmed adequate coronary flow reserve.

Finally, a novel single branched stentgraft — Nexus was safely implanted to the aortic arch and brachiocephalic trunk (Figure 1D), which eliminated the leak and protected the patient against further growth of the aneurysm (Figure 1E). The patient with three implanted aortic stentgrafts (Fig. 1F) was discharged in a good condition after 5 days.

A Nexus system is indicated for patients with aortic arch pathologies, including aneurysm, dissection, pseudoaneurysms or penetrating ulcers. Planer et al. described an initial evaluation of the Nexus system in 28 patients. Thirty-day mortality rate was 7.1%, stroke rate was 3.6% and one-year mortality was 10.7%, without device or aneurysm-related death [1].

In the described case, the Nexus system was used due to type IA leak. Endovascular leaks are the most common complications after aortic stentgrafts implantation, which may lead to the expansion of the aortic aneurysm or even to its rupture [2].

Surgery-related risk estimation approximates a 30-day risk of cardiovascular death, myocardial infarction and stroke [3]. Endovascular abdominal aortic aneurysm repair is an intermediate surgical risk intervention (1%–5%), while aortic arch interventions are procedures with a higher risk of complications, including stroke or aortic valve injury [4].

Our patient was challenging because of the history of previous ascending aorta surgery and two aortic stentgraft implantations and a planned intervention on the aortic arch. Biomarker measurements and noninvasive cardiac imaging were required because of transient unexplained symptoms in the high risk patient [3]. O'Driscoll et al. revealed that echocardiographic indices obtained electively before surgery were more important at predicting outcome than conventional risk factors in patients undergoing endovascular abdominal aneurysm repair [5].

It seems reasonable to assess individually all cardiologic patients before aortic endovascular interventions, because they are often a challenge and require comprehensive evaluation.

## Supplementary material

Supplementary material is available at [https://journals.viamedica.pl/kardiologia\\_polska](https://journals.viamedica.pl/kardiologia_polska).

## Article information

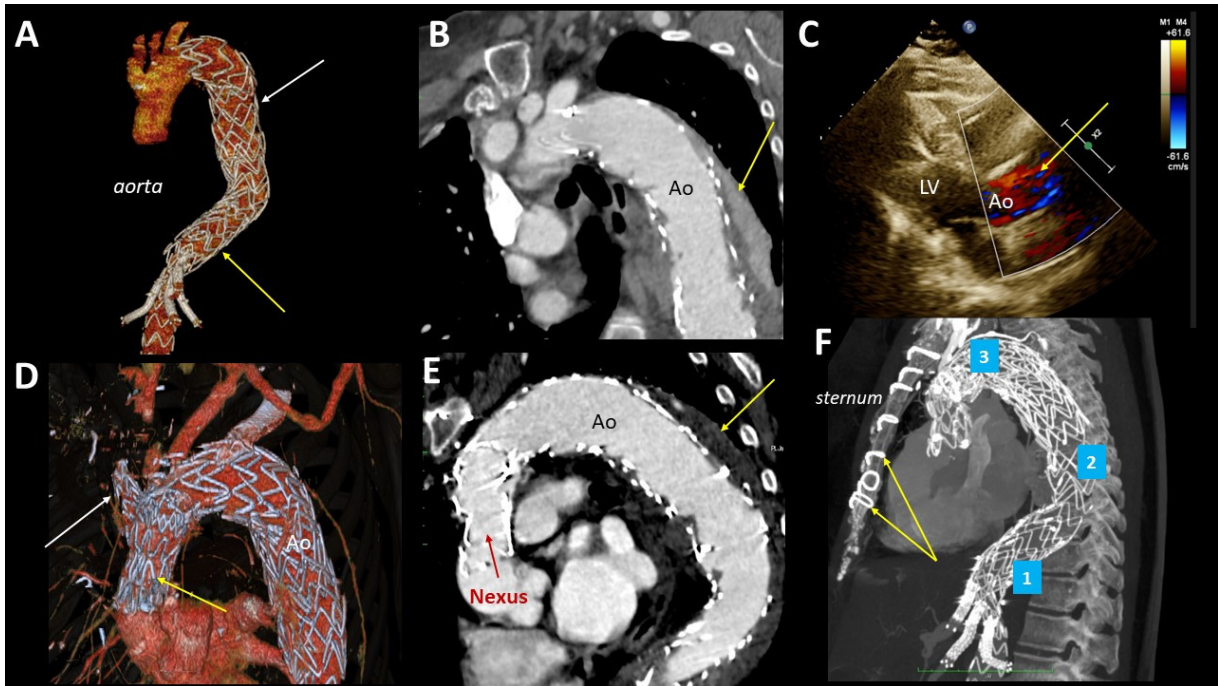
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**Figure 1.** Computed tomography angiography and transthoracic echocardiography in a patient with a history of four procedures on the aorta. **A.** Computed tomography angiography of the aorta in 3D option: thoracic stentgraft below the left subclavian artery (white arrow) and thoracoabdominal stentgraft with visceral branches (yellow arrow). **B.** Computed tomography angiography: endovascular leak (arrow). **C.** Transthoracic echocardiography (color Doppler, long axis view): blood flow in the ascending aorta graft (arrow); Supplementary material, *Video S1*. **D.** Computed tomography angiography of the aorta in 3D option after the procedure: Nexus aortic arch stentgraft (yellow arrows) and a branch to the brachiocephalic trunk (white arrow). **E.** Computed tomography angiography after the procedure: no endovascular leak (arrow). **F.** Computed tomography angiography: three aortic stentgrafts in one patient (1–3); metal sutures on the sternum after cardiac surgery (arrows)  
 Abbreviations: Ao, aorta; LV, left ventricle