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SHORT REPORT

Multi-component Parallel Endografts at Complex TEVAR May Be Prone to Modular Dislocation Causing Novel Endoleaks: A Tale of Two Cases

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Introduction: We report two cases of complex thoracic endovascular aneurysm repair (TEVAR) with endoleakage due to modular dislocation of multi-component left subclavian parallel endografts in periscope configuration.
Report: First, a 67-year-old female patient presented with a 75-mm thoracic aortic aneurysm that was treated by right-to-left carotid–carotid bypass, and TEVAR with a two-piece left subclavian arterial periscope. This was complicated by modular disconnection of the periscope components and also proximal migration of the upper component of the periscope, resulting respectively in endoleaks due to modular disconnection and partial loss of seal. Second, a 65-year-old man presented with a chronic type B aortic dissection with combined true and false lumen diameter of 65 mm, treated by TEVAR and a three-piece left subclavian arterial periscope, which was complicated by modular dislocation of only the upper overlap. These were successfully treated by percutaneous endografting to bridge the disconnected segments, and to also achieve a seal in the left subclavian artery for the first patient.
Discussion: These cases indicate multi-component parallel endografts at TEVAR may be prone to modular disconnection, possibly due to distracting forces contributed by the configuration of the main thoracic endograft in conjunction with flow haemodynamics. They also highlight the need for longer overlap zones for the stent-grafts used in chimney–periscope–snorkel techniques and use of single long pieces whenever possible. We would also suggest review of the current endoleak classification in this context.

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INTRODUCTION

Technical evolution continues in the area of endovascular aneurysm repair (EVAR) with novel stent-graft configurations in terms of chimney–periscope–snorkel (CHIMPS) deployments,[1,2] particularly in the context of thoracic endovascular aneurysm repair (TEVAR), which are not without their own issues as exemplified below. We thus highlight complications pertaining to endoleaks following CHIMPS applications in two representative cases; furthermore, although endoleak classification pertaining to standard endograft deployments for aortic aneurysms in any area is well established,[3] this does not currently include those directly pertinent to CHIMPS.

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REPORT

Patient A

A 67-year-old female was referred by the cardiothoracic surgeons with a 75-mm thoracic aortic aneurysm (TAA). She had had a patch repair of an aortic coarctation and also an aortic valve replacement in the past, for which she was warfarinised. Anatomical considerations in terms of the pre-operative planning aspects were the left common carotid artery (LCCA) in the landing zone (Fig. 1A), which would necessitate coverage of Ishimaru zone 1, and also an ectatic left subclavian artery (LSA) (Fig. 1A). In a single sitting she therefore underwent, under general anaesthesia, a hybrid periscope-TEVAR. To specify, she first underwent a right-to-left carotid–carotid bypass using a 6-mm Propaten graft (W.L. Gore & Associates, Inc., Medical Products Division, Flagstaff, AZ, USA). Thereafter, employing open right femoral plus percutaneous left femoral access, the TEVAR component of the procedure was undertaken with deployment of two overlapped thoracic 38 × 217 mm and 44 × 179 mm endoprostheses (Alpha Thoracic, Cook Aortic

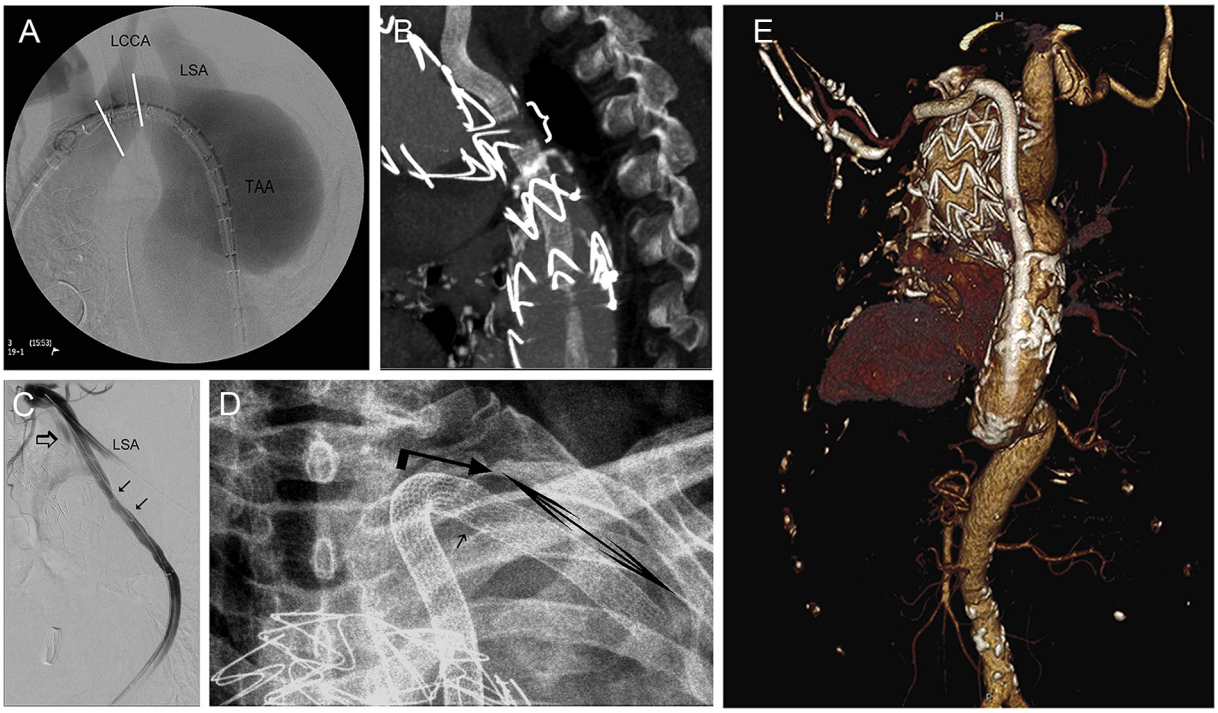

Figure 1. Patient A (A) Intra-operative angiogram highlighting the aortic anatomy in particular the configuration of the LCCA and LSA. White bars highlight the proximal landing area in Ishimaru zone 1. (B) CT reconstruction highlighting (flower bracket) the modular disruption in the LSA periscope. (C) Intra-operative angiogram highlighting the sealing zone endoleak in the LSA (twin arrows indicate relined section of the dislocated endoprostheses; hollow arrow indicates endoleak due to loss of seal at the LSA). (D) Chest radiograph indication the initial distal landing zone in the LSA (jointed arrow), the extension (double-headed arrow) and the transition (single arrow). (E) Volume-rendered CT reconstruction indicating the relined periscope and the thoracic aortic endograft (left posterolateral view). CT = computed tomography; LCCA = left common carotid artery; LSA = left subclavian artery; TAA = thoracic aortic aneurysm.

Intervention, Bloomington, IN, USA; proximal and distal respectively), with the proximal end covering the LCCA ostium. Two 8 × 100 mm heparin-bonded endoprostheses (Viabahn, W.L. Gore & Associates, Inc.) were synchronously deployed as a LSA periscope via an open brachial approach with an intentioned 2-cm overlap. All ends were ballooned and gutter overlaps ballooned simultaneously using a moulding balloon for the main thoracic endograft (Coda; Cook Aortic Intervention) and a non-compliant 8-mm balloon for the periscope devices. The distal sealing zone (TEVAR component) was deliberately endostapled with Heli-Fx EndoAnchors (Aptus Endosystems, Inc., Sunnyvale, CA, USA) opposite the gutter formed by the lower LSA periscope component. The completion angiogram did not suggest any endoleaks. Spinal drainage was monitored and removed in 48 hours and the patient was discharged with no complications and a palpable left radial pulse.

A check computed tomography angiogram (CTA) in the second week post procedure suggested modular dislocation between the two Viabahn endoprostheses with endoleakage into the TAA sac (Fig. 1B). Clinical review indicated she had lost her left radial pulse, with the left arm blood pressure dropping to 78/55 mmHg. This was her non-dominant arm, and, as she was asymptomatic, it was presumed that the upper Viabahn had thrombosed and could be left alone. However, she was admitted to hospital with exacerbation of prior chest symptoms, and a repeat CTA (8 weeks post procedure at this stage) revealed sac enlargement to 85 mm and that both components of the LSA periscope were in fact patent (probably because she was warfarinised for her aortic valve replacement).

She therefore underwent an urgent re-line of the LSA periscope in the same admission. This was undertaken under local anaesthesia using percutaneous right common femoral access. The two components of the periscope were bridged with an 8 × 100 mm Viabahn endoprosthesis, which revealed a landing zone endoleak in the LSA (Fig. 1C). Given she had a small left vertebral artery (LVA) compared with the RVA, this was then covered by a further 8 × 250 mm Viabahn to achieve more secure landing into the second part of the LSA (Fig. 1D). All landing zones/overlaps were gently ballooned, with particular attention to minimising disruption of the gutter area. The completion angiogram revealed no endoleaks and the patient was discharged home with a good left radial pulse, and no neurological complications (Fig. 1E).

Patient B

A 65-year-old male was referred with a chronic type B aortic dissection (TBAD) with combined false lumen and true lumen (TL) diameter of 65 mm, with TL compression to a minimum 13 mm diameter. He had a background of juvenile rheumatic heart disease and had subsequently undergone a