

Simultaneous endovascular aortic aneurysm repair and transcatheter aortic valve implantation in the hybrid operating room

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Summary

We report a 79-year-old woman with severe aortic stenosis and a concomitant abdominal aortic aneurysm. The patient underwent simultaneous percutaneous treatment of both entities in the hybrid operating room. Following this case report, we discuss the potential advantages and disadvantages of such procedures.

Keywords: endovascular aortic aneurysm repair, hybrid operating room, transcatheter aortic valve implantation

Case description

A 79-year-old woman was referred with severe, symptomatic (New York Heart Association grade III) aortic stenosis. Her mean transvalvular gradient was 42 mm Hg, the calculated aortic valve area was 0.8 cm² and her left-ventricular ejection fraction was preserved. She also had persistent atrial fibrillation, a history of a cerebrovascular accident, diabetes and chronic kidney failure with a glomerular filtration rate of 30 ml/min/m². Because of her age and comorbidities, the heart team decided to schedule the patient for transcatheter aortic valve implantation (TAVI). However, on routine preprocedural computed tomography, an infrarenal abdominal aortic aneurysm (AAA) with a diameter of 64 mm became evident. After interdisciplinary discussion with the vascular surgeons, the decision was made to treat both the aortic stenosis and the AAA in the hybrid operation room fully percutaneously via transfemoral access. The AAA was treated first owing to the risk of periprocedural hypertension and rupture of the aneurysm.

Endovascular aortic aneurysm repair (EVAR) was performed after ultrasound-guided puncture of both common femoral arteries with an aortic-bifurcated endograft (Bolton Treo 36–80 mm, Terumo Aortic, Scotland, UK) prosthesis via an 18F sheath for the main body (fig. 1). Thereafter, transfemoral TAVI was performed with an ACURATE neo transcatheter heart valve in standard fashion through the aortic stent graft (fig. 2). The large 18F sheath required for TAVI was carefully advanced under

fluoroscopy through the prosthesis to avoid dislodgement of the stent graft. Both procedures were successful, and access was closed using an 18F MANTA device (Essential Medical Inc., Malvern, Pennsylvania, USA, fig. 3) on both sides. However, a surgical cut-down was needed on one side because of ongoing bleeding. The duration of the procedure was 4 hours and 21 minutes, fluoroscopy time was 31 minutes and a total of 105 ml of contrast was administered. Her further in-hospital course was uneventful with stable kidney function. At 1-month follow-up, there was no endoleak (EVAR), no paravalvular leak and the mean transaortic gradient was 4 mm Hg (TAVI).

Discussion

Only a few case reports of simultaneous percutaneous treatment of aortic stenosis and aortic aneurysm exist [1, 2]. This is the first time that two MANTA devices were used for closure of both large-bore arteriotomies in such a setting, although a cut-down had to be performed on one side because of ongoing bleeding. A simultaneous treatment strategy may have several advantages for the patient. In our experience, systemic blood pressure often rises within the first 10 minutes after TAVI. With the procedures performed sequentially, the AAA may be exposed to high blood pressure resulting in an increased risk of rupture [3]. Furthermore, as in our patient, TAVI and EVAR can be performed through the same 18F sheath. Therefore, the patient is only exposed once to the risk of vascular complications and bleeding. Potential disadvantages of this approach may be the amount of contrast required and the reimbursement for the hospital. In 2018, reimbursement at our hospital was CHF 57193 for TAVI and CHF 38014 for EVAR. In this case, the hospital received only the fee for TAVI. However, there is a 12% mortality rate per year related to untreated aneurysms over 6 cm as a result of rupture [4]. In more recent publications and in our own experience, 1-year mortality after TAVI is less than 10%. Thus, it did not appear reasonable to expose the patient to such a high risk of a potentially lethal complication.

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The potential advantages of hybrid procedures

Hybrid procedures combine features of the catheterisation laboratory with the sterility of an operating room, aiming to reduce invasiveness of complex procedures and improve outcomes [5]. Currently, the most popular procedures are coronary artery bypass grafting along with percutaneous coronary intervention (PCI), valve replacement or repair along with PCI, and aortic debranching procedures combined with endovascular grafting. However, in clinical routine, such procedures are often performed sequentially, not

simultaneously. Nevertheless, solid evidence proving superiority of such an approach is lacking.

The MANTA closure system

The MANTA is a novel, collagen-based closure device facilitating percutaneous closure of large arteriotomies up to 24.5F outer diameter. It has been successfully used after procedures such as TAVI, EVAR, or implantation of extracorporeal membrane oxygenation or an Impella pump. The device has been previously described in detail [6]. In brief, puncture depth is measured after insertion of a 6F

Figure 1: Abdominal aortic aneurysm before and after percutaneous treatment. On preprocedural TAVI-CT, a large, partially thrombosed aortic aneurysm was present (A, arrow, B). The aneurysm was treated and TAVI was performed through the aortic stent graft. Finally, access was closed on both sides using 18F and 14F MANTA devices (C, arrows).

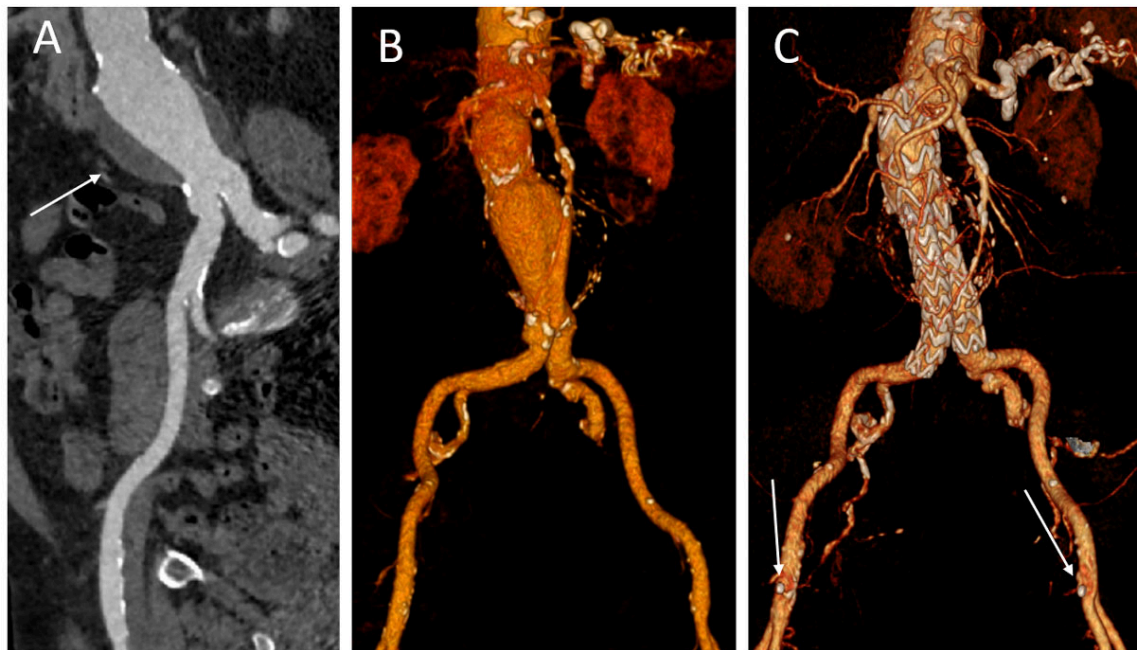


Figure 2: Implantation of the ACURATE neo transcatheter heart valve through the endovascular prosthesis. The endograft was crossed with the long sheath without any resistance (A). Thereafter, the valve was predilated and the ACURATE neo was implanted in this patient with a horizontal aorta (B) with a good haemodynamic result (C).

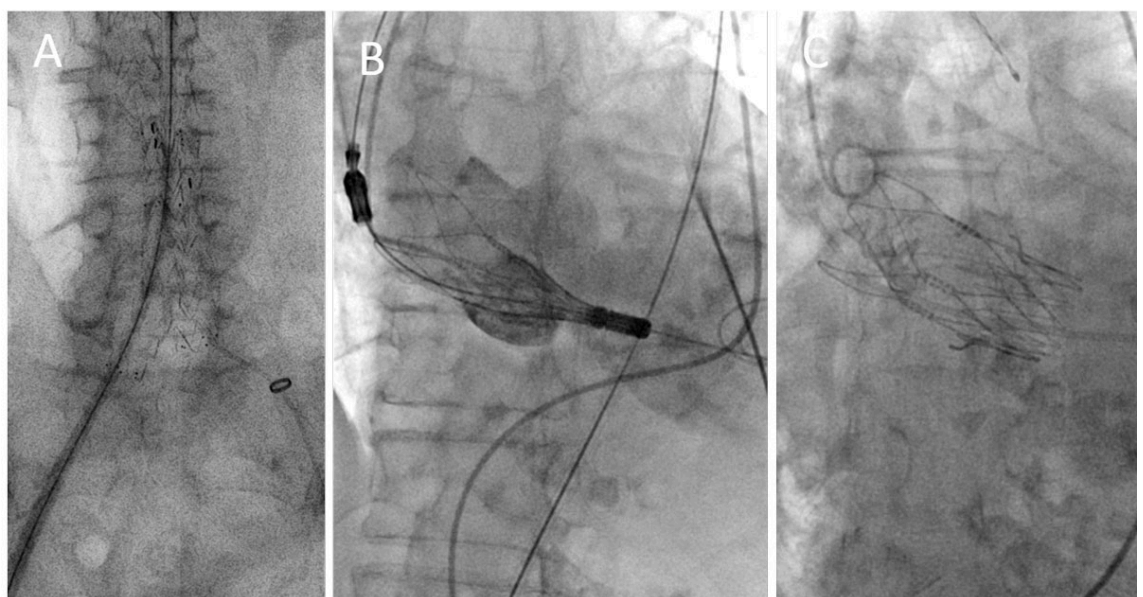
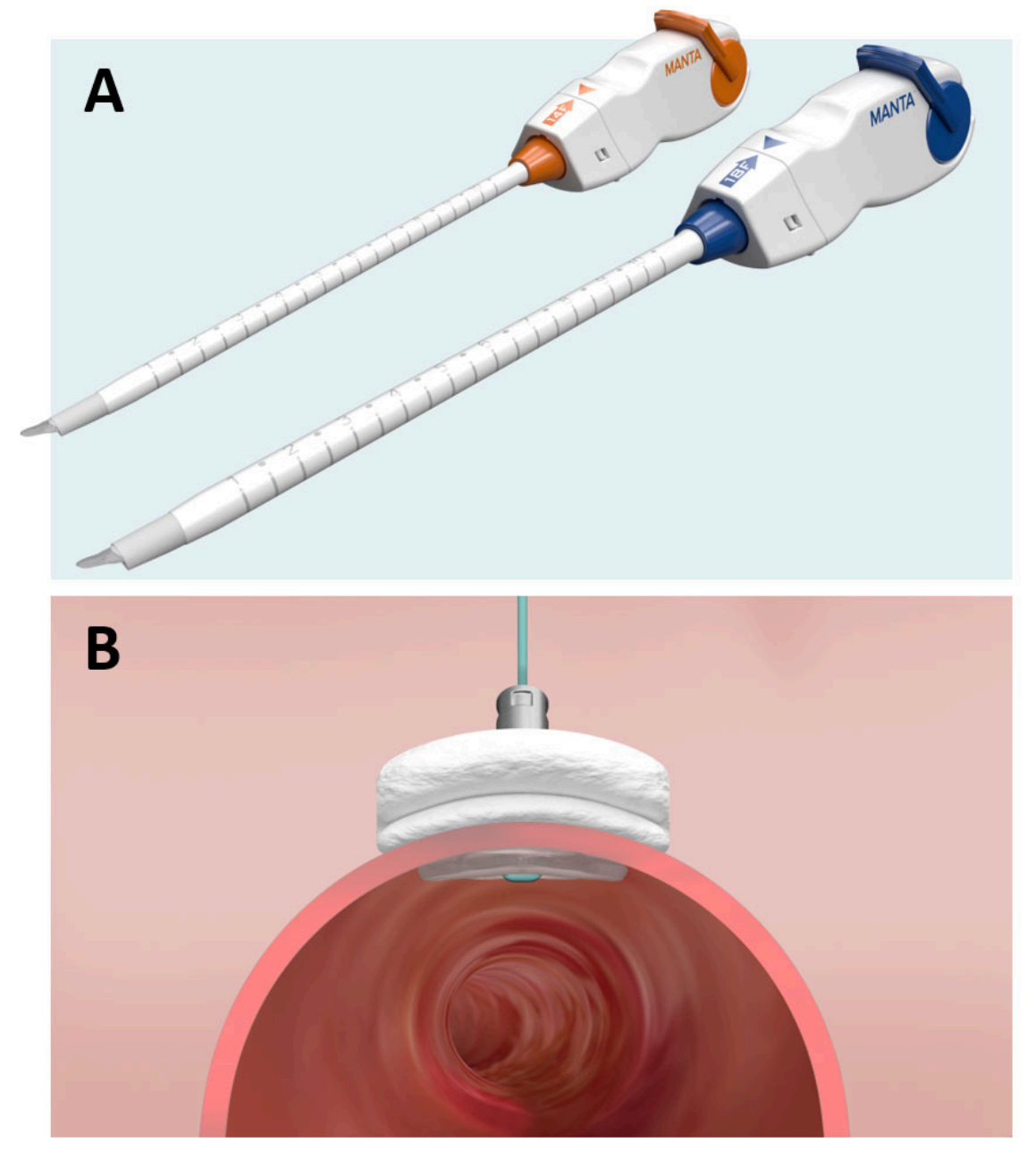


Figure 3: The MANTA closure device. The MANTA closure device has been specifically designed for closure of large-bore arteriotomies and is available in two different sizes (14F and 18F, A). Haemostasis is achieved with an intraluminal resorbable polymer toggle and an extraluminal, resorbable, bovine collagen plug. The toggle and the plug are tightened with a non-resorbable polyester suture topped by a radiopaque, stainless steel suture lock (B).



sheath. Then the large sheath is inserted. After the procedure, the large sheath is exchanged for the dedicated MANTA sheath. The MANTA device is inserted, and positioned and deployed according to the previously measured puncture depth. Deployment usually takes only 1–2 minutes, and immediate haemostasis is achieved in a large proportion of patients [7]. Case series have reported major vascular complications in 1–9% of patients [8–10]. The risk of infection appears to be small. Up to now, there is no randomised controlled trial comparing the MANTA with the widely used and well established preclosure technique utilising two ProGlides [11].

In summary, this case report shows that such combined procedures are feasible and appear to be safe and may ben-

efit the patient. However, the current reimbursement situation may hinder a broader acceptance of such procedures in many countries, including Switzerland.

Potential competing interests

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