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1 Type B aortic dissection treated with a branched aortic arch stent graft and the STABILISE technique

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9 We report the case of a 57-year-old woman diagnosed with an asymptomatic chronic type B aortic dissection.

10 The maximum aortic diameter was 70 mm in the proximal descending thoracic aorta. The entry tear was located
11 at the aortic isthmus, and the proximal neck included all of the supra-aortic trunks. The targeted proximal neck
12 was ≥ 25 mm. The dissection extended to the infrarenal aorta. The patient was treated with a custom branched
13 aortic graft with two branches, one for the innominate trunk and one for the left common carotid artery,
14 combined with the stent-assisted balloon-induced intimal disruption and relamination technique. This combined
15 technique seemed to provide a proximal seal zone in the arch and allow remodeling of the distal aorta in this
16 patient with aneurysmal type B aortic dissection.

17 Keywords: Aortic dissection; branched stent graft; STABILISE

18 Introduction

19 Endovascular treatment is a minimally invasive, potentially curative approach for type B aortic dissection. The
20 first-line endovascular technique is thoracic endovascular aortic repair (TEVAR). However, TEVAR alone
21 results in total occlusion of the false lumen in 13-30% of cases, with a mortality rate of approximately 36% at 3
22 years(1,2). Extensive residual dissection involving the aortic arch and abdominal aorta is still a major concern
23 and a therapeutic challenge. Branched arch grafts have shown promising results in this particular indication in
24 terms of achieving proximal sealing (3). The stent-assisted balloon-induced intimal disruption and relamination
25 (STABILISE) technique has also shown good results in the treatment of acute and chronic aortic dissection(4,5)
26 by achieving distal sealing of the false lumen in the descending thoracoabdominal aorta. Here, we report a
27 combined treatment for type B aortic dissection consisting of a branched aortic arch graft and the STABILISE
28 technique.

29 Case report

30 A 57-year-old woman presented with an asymptomatic type B aortic dissection diagnosed during examination
31 for central facial paralysis. She had a history of ischemic stroke, which resulted in cognitive sequelae as well as
32 left hemiparesis. Her cardiovascular risk factors included high blood pressure and insulin-requiring diabetes
33 mellitus. She was first treated surgically for abdominal aortic rupture, occurring 3 days after diagnosis of the
34 dissection, via conventional infrarenal abdominal aortic repair. There was a rapid increase in the size of the
35 proximal descending thoracic aorta, with a maximal diameter of 70 mm 4 months later (Figure a, video 1). The
36 dissection extended to the infrarenal aorta and to the proximal anastomosis of the aortic tube. The ascending
37 aorta was 38 mm in diameter. The entry tear was 27 mm long and located at the aortic isthmus, and the proximal
38 neck included all of the supra-aortic trunks. The targeted proximal neck was ≥ 25 mm. A multidisciplinary aortic
39 team including a vascular surgeon, a cardiac surgeon, a radiologist, a cardiologist and an anesthesiologist
40 decided to perform endovascular treatment with a custom branched aortic graft with two branches, one for the
41 innominate trunk (IT) and one for the left common carotid artery (LCCA), combined with the STABILISE
42 technique under general anesthesia in a multimodal angiography suite (Discovery IGS 730, GE Healthcare,
43 Chicago, USA). Cerebrospinal fluid (CSF) drainage was used to prevent medullary ischemic injury(6). The left
44 subclavian artery was reimplanted directly into the LCCA during the same procedure.

45 Bilateral transverse supraclavicular cervicotomy was performed to control the CCAs. Rapid pacing was used to
46 ensure precise, atraumatic landing and to avoid retrograde dissection(7). Using a percutaneous approach, a
47 tapered aortic endoprosthesis of 42x26x255 mm (RELAY®, Terumo Aortic) was deployed under 2D/3D fusion
48 imaging and transesophageal US to ensure localization in the true lumen. Orthogonal rings were used to
49 precisely deploy the branched graft one centimeter above the IT and the LCCA(8). A 10-F introducer sheath was
50 inserted into the LCCA, and we catheterized the LCCA branch. To ensure localization in the stent graft branch
51 and not between the aorta and the stent graft, we inflated a balloon in the stent graft branch, and we then
52 deployed the tapered branch (13x8x90 mm). A 10-F introducer sheath was placed into the right common carotid
53 artery (RCCA), and we catheterized and deployed the tapered IT branch (13x17x80 mm) using the same
54 technique (Figure b). We deployed a second stent graft in the descending aorta, ending 3 cm above the celiac
55 trunk (40x40x15 mm) (W. L. Gore & Assoc, Flagstaff, AZ). We deployed a bare stent 46 mm in diameter x 185
56 mm in length (ZDES; Cook Medical, Bloomington, IN) up to the aortic bifurcation, and we ruptured the intimal
57 flap using a Tri-Lobe balloon catheter and an inflation device. We used the aortic mask to determine when the
58 balloon reached the size of the false lumen. The patient was extubated at the end of the intervention in the
59 operating room. The duration of the procedure was 190 min. The duration of fluoroscopy was 58 min 47 s. The

60 dose area product was 146.11 Gy.cm². The volume of contrast media used was 90 cc. Postoperatively, the patient
61 received treatment with pressor amines, with an average blood pressure target of 100 mmHg. Two days after the
62 procedure, she presented with paraparesis, which required extension of the CSF drainage up to 4 days, with a
63 pressure target of 10 mmHg(9). She achieved complete recovery at 3 days. The hospitalization duration was 17
64 days, with a length of stay in the intensive care unit of 5 days. Angio-CT performed 8 days after the intervention
65 showed complete thrombosis of the false lumen and patency of the IT, LCCA branches, celiac trunk, superior
66 mesenteric artery and renal arteries (Figure c, video 2).

67 Discussion/Conclusion

68 Postdissection aortic aneurysms result from elevated pressure in the false lumen. Fenestrated and branched stent
69 grafts in the aortic arch have been used in some expert centers to treat postdissection aortic arch aneurysms in
70 patients unfit for open repair, with an in-hospital death rate of 5.3%; possible complications include early type 1
71 endoleakage (5.3%) and cerebrovascular events (10.5%), with the absence of late aorta-related mortality(3). The
72 STABILISE technique allows aortic remodeling in cases of acute and chronic type B dissection while not
73 compromising the patency of collateral branches arising from the true lumen(4,5). One point that must be
74 anticipated is the shortening and possible displacement of the stent graft during aortoplasty.

75 One of the limitations of the STABILISE technique is that the distal part of the stent graft should end up in an
76 area where the maximal aortic diameter (combining the true and false lumen) does not exceed 42 mm over a
77 length of at least 20 mm(5). This novel combined technique seems to provide a proximal seal zone and allow
78 both thrombosis of the thoracic aortic false lumen and remodeling of the distal aorta in patients with type B
79 aortic dissection without a proximal neck.

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107 Figure 1. Angio-CT before the intervention showing the entry tear at the aortic isthmus (white arrow), the true
108 lumen (white arrowhead), and the false lumen (white dotted arrow), and aortic diameters

109 Figure 2. DSA run showing the IT branch (white arrow), the LCCA branch (white dotted arrow), and the
110 subclavian-carotid transposition (white arrowhead)

111 Figure 3. Angio-CT after the intervention showing the IT and CCA branches (white dotted arrows), the
112 subclavian-carotid transposition (white arrow), the TEVAR (star), and the bare stent (white arrowhead)





