

# Balloon-expandable stent graft for coral reef aorta

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## ABSTRACT

Coral reef aorta (CRA) is a rare aortic occlusive disease with calcified intraluminal lesions. We report the case of a patient with CRA who underwent endovascular treatment (EVT). A 78-year-old woman presented with intermittent claudication. A computed tomography scan showed a preocclusive calcified lesion in the infrarenal aorta. EVT with a balloon-expandable stent graft was successfully performed, and her intermittent claudication improved. Compared with the conventional surgical treatments for CRA, EVT with a balloon-expandable stent graft is less invasive. This procedure is an effective option for the treatment of CRA. (*J Vasc Surg Cases and Innovative Techniques* 2020;6:422-4.)

**Keywords:** Arterial occlusive disease; Vascular calcification; Endovascular procedure; Surgical procedure

Coral reef aorta (CRA) is a rare type of atherosclerotic disease described as rock-hard calcifications that grow into the lumen of the suprarenal and juxtarenal aorta.

Conventional surgical procedures have traditionally been performed,<sup>1,2</sup> but are invasive. Endovascular treatment (EVT) is minimally invasive and effective for CRA; however, little has been reported on EVT using a balloon-expandable stent graft (BESG) for CRA. The use of this procedure for CRA will increase in the future. Here, we report a case of CRA treated with EVT using a BESG.

Written informed consent was obtained from the patient for publication of this case report and the accompanying images.

## ETHICAL APPROVAL

Ethical review board approval was waived because the risk is negligible, and only nonidentifiable data were used.

## CASE REPORT

A 78-year-old woman was referred to our hospital with bilateral intermittent claudication of the buttocks and thighs, which had become worse (maximum walking distance 50 m). She did not have any other manifestations of atherosclerosis. Her medical history included hypertension. She never smoked. Physical examination revealed reduced

bilateral femoral pulses. Blood pressure was 131/73 mm Hg, and the ankle-brachial index was 0.5 on both sides. Her serum creatinine level was 0.63 mg/dL, and echocardiography showed mild aortic stenosis. A computed tomography scan showed a preocclusive calcified lesion in the juxtarenal and infrarenal aorta which protruded into the lumen of the infrarenal aorta (*Fig 1*).

We considered both surgical treatment and EVT because exercise and pharmacotherapy were ineffective. Because there was a narrow opening in the aortic lumen at the level of the preocclusive calcified lesion, we selected EVT with a stent or stent graft placement. First, a 4F sheath (Zeon Medical Inc, Tokyo, Japan) was inserted in the right femoral artery under local anesthesia. A 0.035-inch Radifocus guidewire (Terumo Corp, Tokyo, Japan) supported by a 4F CXI support catheter (Cook Medical, Bloomington, Ind) was advanced in the subintimal space. We determined that it was easier to pass the guidewire through the left side of the aorta in an antegrade approach than a retrograde approach. A 4F sheath was inserted in the left brachial artery, and a 4F pigtail catheter (Terumo Corp) was advanced through this sheath to the juxtarenal aorta. Aortography showed the preocclusive calcified lesion protruding into the right-sided lumen of the infrarenal aorta and a narrow intra-aortic open space on the left side (*Fig 2*). A 0.014-inch guidewire was passed antegrade through a 4F CXI support catheter from the aorta to the right external iliac artery. The guidewire was exchanged for a 0.035-inch Radifocus guidewire. The tip of the Radifocus guidewire was then withdrawn from the femoral sheath. The 4F femoral sheath was replaced with a 7F, 25-cm long sheath (Terumo Corp), which was advanced to the preocclusive area. An 8 × 59 mm VIABAHN VBX balloon-expandable endoprosthesis (WL Gore & Associates, Flagstaff, Ariz) was placed across the calcified lesion.

Postdilation was performed using a 12 × 40 mm semicompliant balloon without abdominal pain. The final aortography and intravascular ultrasound imaging showed satisfactory expansion of the VBX (*Fig 2*). The access site was manually compressed, and no complications occurred. The patient's intermittent claudication improved, and she

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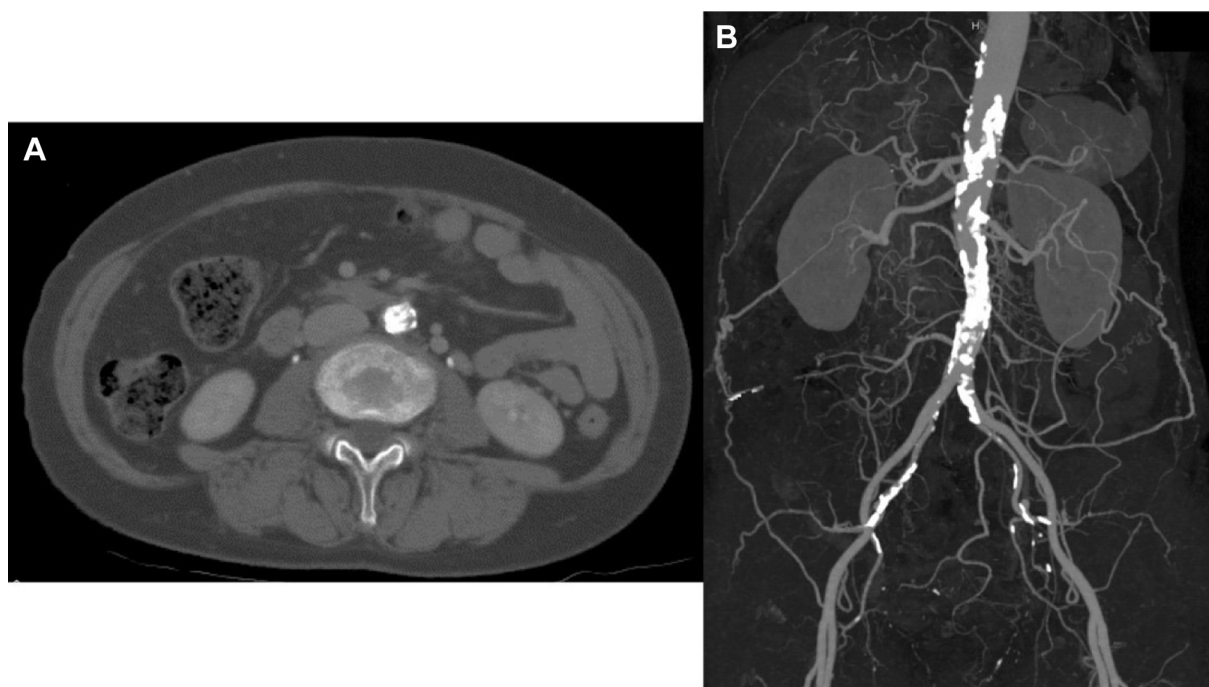
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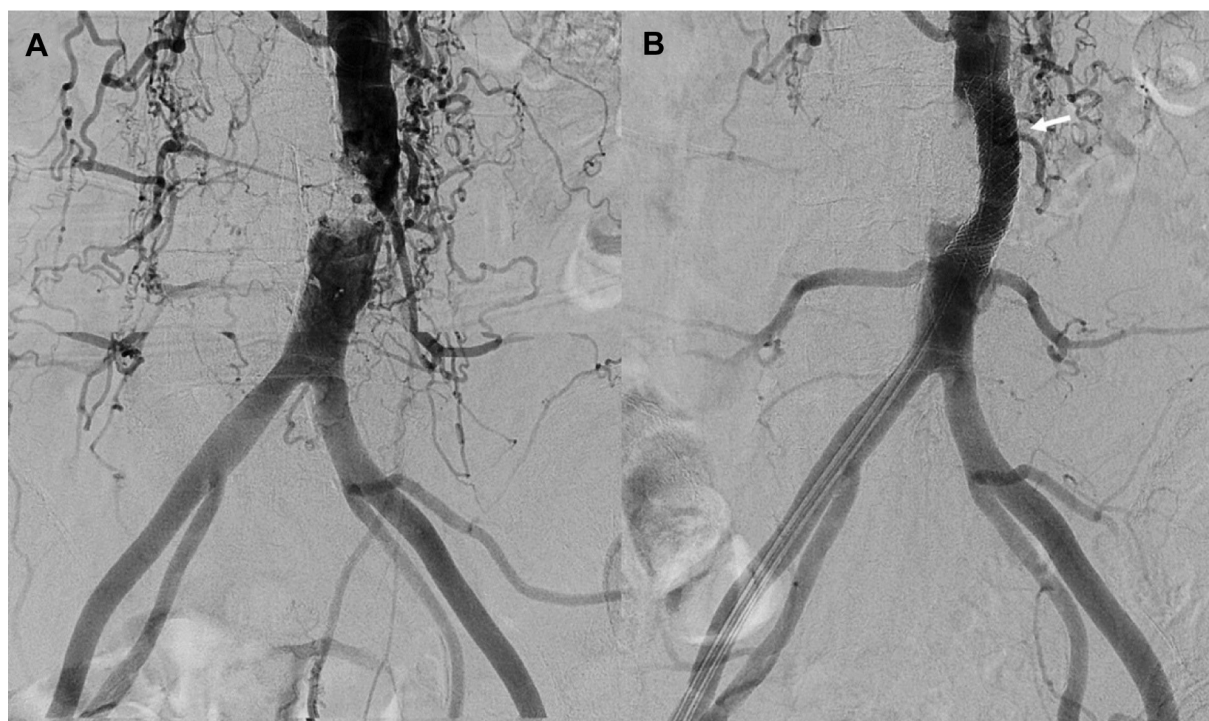
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**Fig 1.** **A**, Computed tomography scan showing the preocclusive calcified lesion protruding into the lumen of the infrarenal aorta. **B**, Calcification in the juxtarenal and infrarenal aorta.



**Fig 2.** **A**, Initial aortography showing the preocclusive calcified lesion protruding into the right side lumen of the infrarenal aorta. **B**, Final aortography showing a satisfactory expansion of the VBX stent graft (*arrow*).

was discharged on postoperative day 2. The ankle-brachial index was 1.12 on the right side and 1.08 on the left side after several months.

## DISCUSSION

Our case demonstrates that EVT with a BESG is an option for patients with infrarenal CRA. This procedure can



**Fig 3.** The postoperative computed tomography scan showing satisfactory expansion of the VBX.

be completed with only local anesthesia and arterial puncture. Several reviews have been published since the first cases were reported by Qvarfordt et al<sup>3</sup> in 1984. Conventional surgical procedures for CRA, such as trans-aortic thromboendarterectomy and extra-anatomic revascularization, are invasive, and this perioperative mortality rate is 11.6-13.3%.<sup>4,5</sup> EVT with a bare metal stent and self-expanding stent graft (SESG) for CRA has been performed recently.<sup>6,7</sup> However, SESGs may not be fully expandable owing to a lack of luminal capacity and have a risk of late recoiling.<sup>7,8</sup> The VIABAHN VBX BESG has demonstrated technical success and good patency for iliac atherosclerotic lesions.<sup>9</sup> Compared with SESG, a low-profile sheath can be used. The VBX diameter of 8 mm or less can be inserted with a 7F sheath and decreases the risk of access site complications.<sup>10</sup> The ability to postdilate the stent graft allows customization of a range of diameters to the degree of lumen stenosis.<sup>11</sup> Previous studies reported that a small caliber of the stent is sufficient for symptom improvement<sup>12,13</sup>; we aimed to expand the stent graft to about 50% of the aortic diameter because overexpansion increases the risk of rupture and stent graft fracture (Fig 3). A longer device would unnecessarily occlude the lumbar arteries and prevent clamping of the infrarenal aorta during open surgery if aortic rupture occurred. Therefore, we believed that the lesions should be covered with the minimum length possible. If acute aortic rupture occurred, we would initially control bleeding by intra-aortic balloon occlusion, then select intravascular devices (such as a second stent graft) or open surgery, depending on the extent and location of bleeding. We considered that VBX is preferred for arterial calcified lesions from our experience, whereas we cannot state that VBX is more appropriate than bare metal stent or SESG at the moment,

because little has been reported on EVT for CRA. We consider EVT with a BESG to be an effective option, and further cases are needed to reveal the best device for EVT for CRA. In conclusion, this case demonstrated the minimal invasiveness and effectiveness of EVT using the VIABAHN VBX BESG for CRA. An appropriate procedure must be selected for each patient with infrarenal CRA.

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