

IMAGES IN INTERVENTION

Kissing Intravascular Lithotripsy Facilitated Endovascular Repair of a Complex Saccular Abdominal Aortic Aneurysm With Narrowed Distal Aorta



A First-in-Human Report

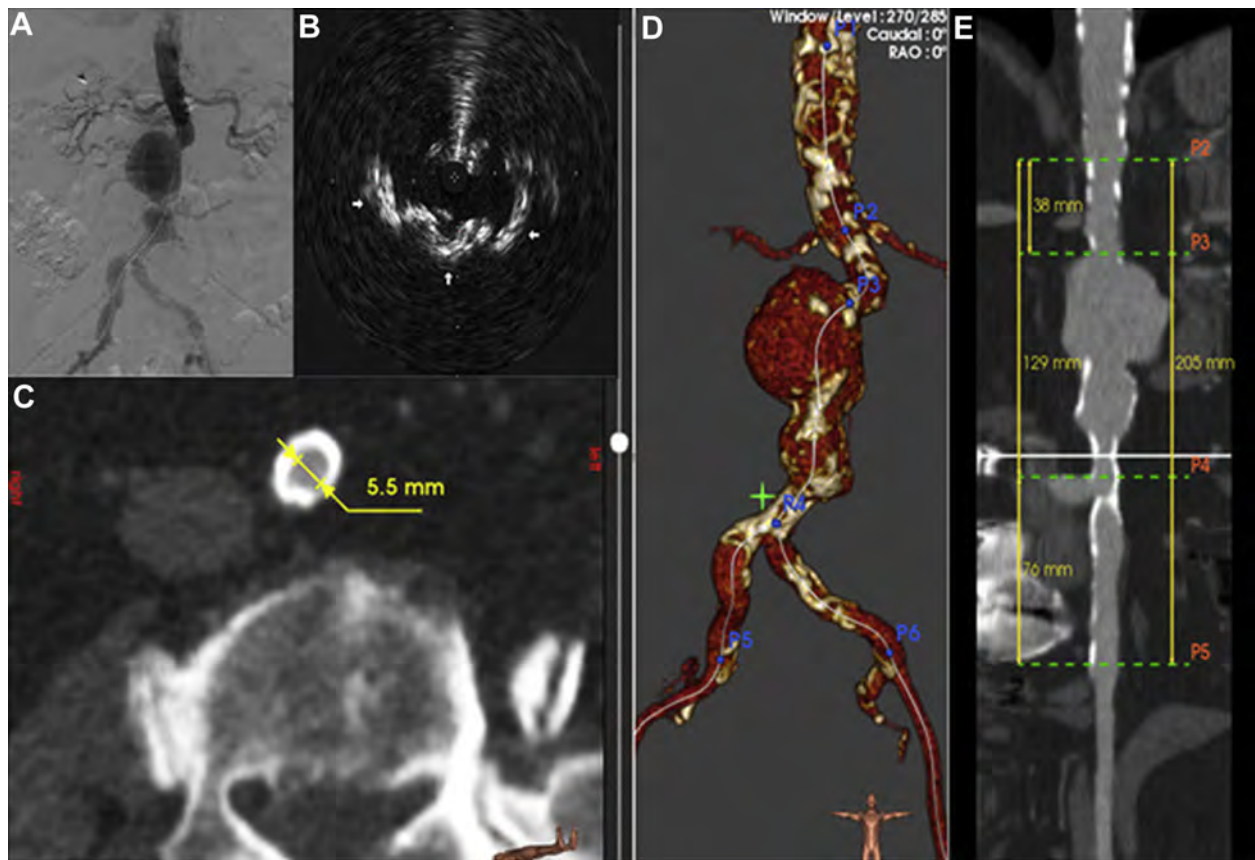
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An 84-year-old woman with known abdominal aortic aneurysm for 18 years, hypertension, chronic obstructive pulmonary disease, obstructive sleep apnea on home oxygen therapy, and carotid artery disease status post-carotid endarterectomy was referred for definitive therapy. Recent computed tomography of the aortoiliac vasculature demonstrated a saccular infrarenal abdominal aortic aneurysm measuring 5.2 cm in diameter with narrowed (but patent) distal abdominal aorta (Figure 1, Online Video 1). Aortoiliac angiogram confirmed the findings and intravascular ultrasound of the narrowed segment demonstrated concentric heavy calcification (Figure 1). Given that the available largest diameter intravascular lithotripsy (IVL) balloon is 7.0 mm, two 7.0 mm × 60 mm Shockwave M5 IVL balloon catheters

(Shockwave Medical Inc., Fremont, California) were inflated side by side using the kissing balloon angioplasty technique (i.e., “kissing lithotripsy”). Both balloons were inflated at low pressure (4 atm) with delivery of 4 treatment cycles and a total treatment time of 120 s. Successful disruption of the concentric calcium was confirmed on intravascular ultrasound imaging and this facilitated the delivery of the endovascular stent graft (Figure 2). Successful endovascular aortic aneurysm repair was completed using the Endologix AFX II (Endologix, Irvine, California) 25 to 110 mm/20 to 30 mm main body bifurcated endograft and Endologix VELA 25 mm to 28 mm/95 mm aortic cuff endoprosthesis. The final angiogram demonstrated excellent positioning and placement of the stent graft with brisk flow to the distal vessels without angiographic evidence of any endoleaks

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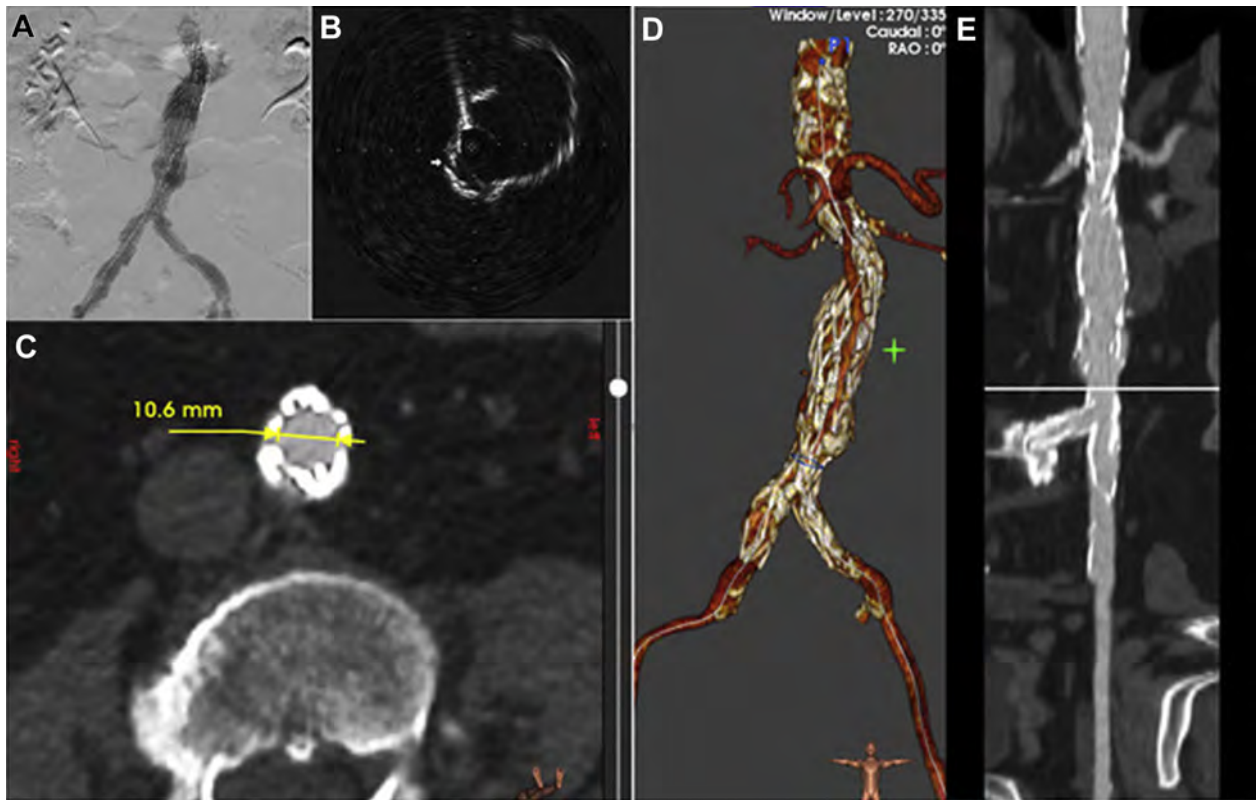
FIGURE 1 Baseline Images

(A) Angiogram demonstrating sacular abdominal aortic aneurysm with narrowed distal aorta before stent-graft placement. **(B)** Intravascular ultrasound of the narrowed aorta demonstrating heavy calcification (**white arrows**). **(C)** Computed tomography showing narrowed aorta measuring 5.5 mm (baseline). **(D)** Reconstructed 3-dimensional computed tomography image demonstrating abdominal aortic aneurysm with narrowed distal aorta before ([Online Video 1](#)) with **(E)** side-by-side coronal images.

(Figure 2, Online Video 2). The Shockwave IVL is a novel device that utilizes pulsatile mechanical energy to disrupt calcified lesions to allow maximal dilatation of a stenosed vessel. We demonstrated the successful technique of kissing lithotripsy in a heavily calcified large vessel to achieve a luminal

gain of >7.0 mm. Although large vessels exceed the currently available IVL devices, incorporating the kissing balloon technique with dual IVL balloons overcomes this limitation. To the best of our knowledge, this is the first in-human report of this novel technique.

FIGURE 2 Post-Intervention Images



(A) Angiogram demonstrating saccular abdominal aortic aneurysm with narrowed distal aorta after stent-graft placement. (B) Intravascular ultrasound of the narrowed aorta demonstrating disrupted calcium after kissing lithotripsy (white arrows). (C) Computed tomography showing narrowed aorta measuring 10.6 mm (1 month post-intervention). (D) Reconstructed 3-dimensional computed tomography image demonstrating abdominal aortic aneurysm with narrowed distal aorta at 1-month post-intervention (Online Video 2) with (E) side-by-side coronal images.

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APPENDIX For supplemental videos, please see the online version of this paper.