

IMAGES IN INTERVENTION

Hemodynamic and Intravascular Ultrasound Evaluation of an Infrarenal Aortic Stenosis



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A 59-year-old man with hypertension and hyperlipidemia presented with symptoms of chest pain, claudication, and erectile dysfunction. He reported exertional chest discomfort occurring with less than a flight of stairs and bilateral lower extremity pain after walking 40 feet. Claudication persisted despite treatment with cilostazol. Ankle-brachial indices and distal pulses were reduced in both legs (right and left ankle-brachial indices = 0.7 and 0.8, respectively).

Coronary angiography with fractionated flow reserve evaluation showed hemodynamically significant lesions in the mid-right coronary artery and mid-left anterior descending coronary artery. These lesions were treated with percutaneous coronary intervention.

There was severe atherosclerotic disease of the distal aorta with a significant infrarenal stenosis (Figures 1A and 1B) with eccentric plaque apparent on intravascular ultrasound (IVUS) (Figure 1C). The infrarenal stenosis was treated with balloon angioplasty and a 14 mm × 40 mm endovascular self-expanding Zilver stent (COOK, Bloomington, Indiana) (Figure 1D). There was a 10 to 20 mm Hg pressure drop across the stenosis at rest that increased to 50 to 60 mm Hg following the administration of 400 µg of

nitroglycerin into the distal aorta (Figure 1E). Following stent placement, there was a minimal pressure gradient at rest or with administration of nitroglycerin (Figure 1E).

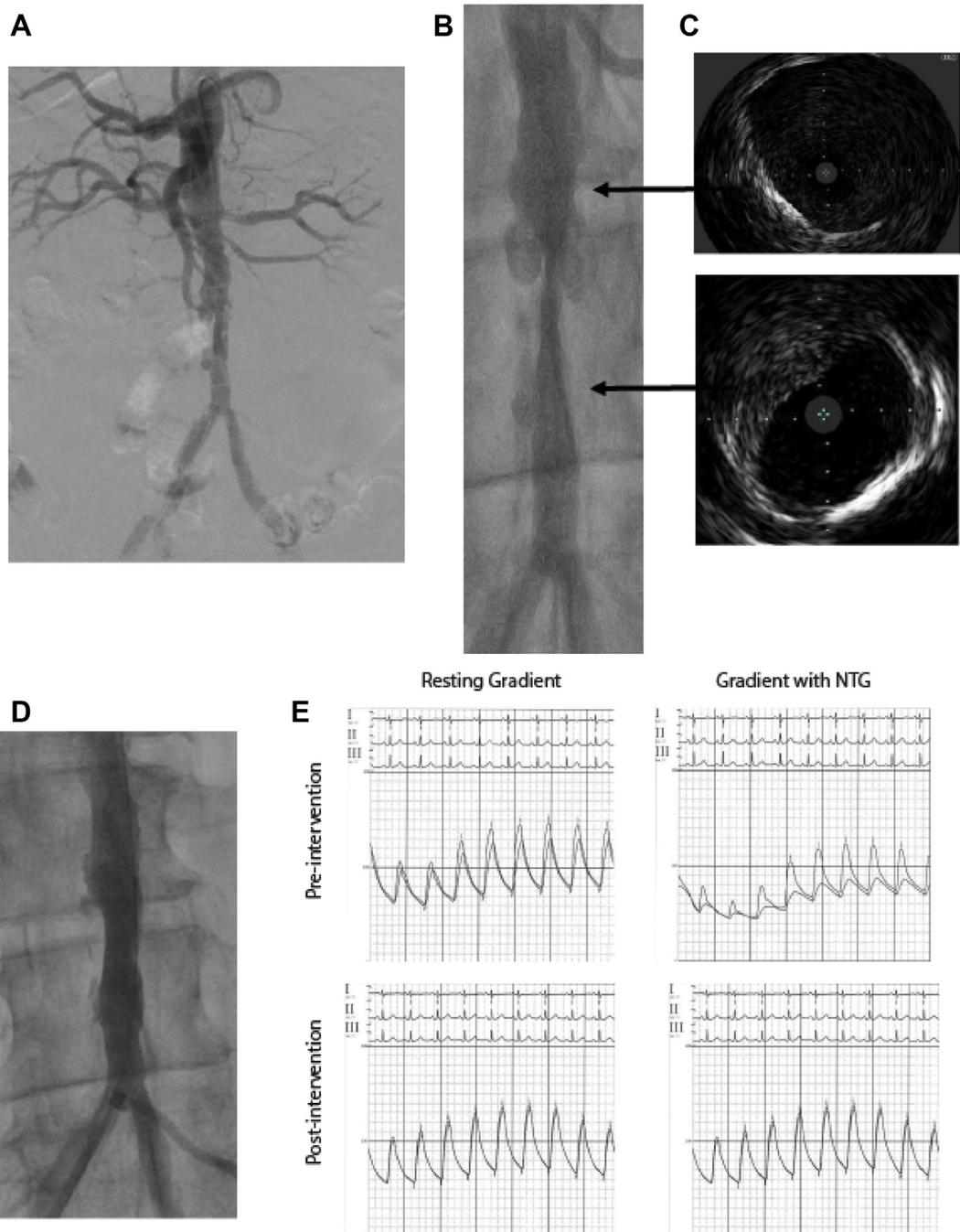
Provocative intra-arterial nitroglycerin was used to increase flow in the distal aorta and simulate the hemodynamic changes that occur during exercise. The pressure drop across the lesion increased significantly under conditions of increased flow, which explains his symptoms of claudication and erectile dysfunction. IVUS allowed accurate assessment of the length and cross-section diameter of the stenosis and helped optimize stent sizing. In addition, it excluded an underlying aneurysm.

Vasodilation challenge with hemodynamic monitoring and IVUS are useful measures to validate clinical symptomatology in atherosclerotic disease conditions and allow optimum endovascular management.

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FIGURE 1 Angiographic, Hemodynamic, and IVUS Evaluation of Aortic Disease

Digital subtraction (**A**) and cineradiographic (**B**) angiograms in an anteroposterior projection of the distal aorta. Intravascular ultrasound images obtained at 2 levels in the distal aorta (indicated by **arrows**) are shown in **C**. The distal aorta after stent placement is shown in **D**. Simultaneous pressures measured in the descending aorta proximal and distal to the stenosis before and after stent placement and with and without intra-aortic administration of 400 μ g of nitroglycerin (NTG) are shown in **E**.