

Cardiac Imaging

Percutaneous Transluminal Coronary Angioplasty in a Patient with Three Small Vessel Disease: The Role of Intravascular Ultrasound

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A 69-year-old man, former smoker, with a history of hypertension, hypercholesterolemia and glucose intolerance complained of deteriorating stable angina during the previous two months. Myocardial scintigraphy revealed reversible ischemia of the anterior, inferior and lateral walls of the left ventricle. He was admitted for coronary angiography in order to determine the presence and extent of coronary artery disease.

The coronary angiogram revealed a 50-60% stenosis in the very proximal segment of a diffusely atherosclerotic left anterior descending artery (LAD) (Figure 1A, red arrow) and an aneurysm at the ostium of a large second diagonal branch (Figure 1B, red arrow), a 90% stenosis of a bifurcation lesion (type 1-0-0, Medina classification) in the proximal part of the left circumflex (LCX) (Figure 1A, yellow arrow), and diffuse disease of the right coronary artery (RCA), with a long lesion causing 80-90% stenosis in the proximal segment (Figure 1C).

All three coronary vessels were of notably small size, with reference vessel diameters of 2.3 mm (LAD), 2.2 mm (LCX) and 1.6 mm (RCA) on quantitative coronary angiography (QCA CMS, Medis Leiden). Treatment of this patient should, of course, aim at total coronary artery revascularization. Percutaneous transluminal coronary angioplasty with multiple drug-eluting stent implantation may be considered an equivalent alternative to coronary artery bypass graft surgery, provided that

the small coronary vessel reference diameter, a known predictor of restenosis, could be overcome.¹

Considering that discrepancy between angiographically determined vessel reference and that obtained by intravascular ultrasound (IVUS) is common,² we performed IVUS interrogation of all three vessels (iLab, Boston Scientific) using a motorized pullback system (0.5 mm/s). Vessel diameter was defined as the distance from media to media on IVUS examination. IVUS interrogation revealed the presence of a large amount of positive arterial remodeling in all three vessels. Reference diameter was 3.75 mm in the proximal segment of the LAD (Figure 2A), 4.06 mm in the proximal part of the LCX (Figure 2B), and 3.46 mm even in the distal segment of the RCA (Figure 2C). Moreover, the narrowest cross-sectional area in the very proximal LAD segment proved to represent a significant stenosis (2.3 mm²).

Following IVUS findings, we implanted stents of appropriate diameter – i.e. much larger than the angiographically determined vessel reference diameter – with a very good angiographic result. The stents used were: BioMatrix 3.5/11 mm and 3.0/18 mm (16 atm) in the ostial and proximal LAD (Figures 3A, 3B); BioMatrix 3.0/11 mm (14 atm) in the ostial LCX (Figures 3A, 3B); and BioMatrix 3.0/24 mm (18 atm) at the ostium and BioMatrix 3.0/14 mm (16 atm) in the mid segment of the RCA (Figure 3C).

Compensatory enlargement of athero-

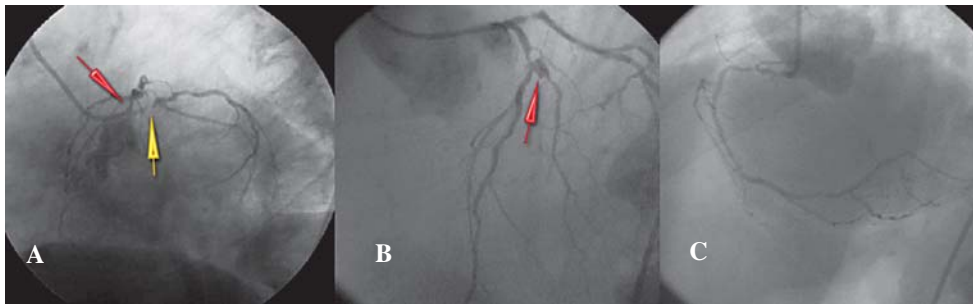


Figure 1. Coronary angiogram showing stenoses in the left anterior descending and left circumflex arteries (A), an aneurysm at the ostium of a large second diagonal branch (B), and diffuse disease of the right coronary artery (C), with a long lesion causing stenosis in the proximal segment.

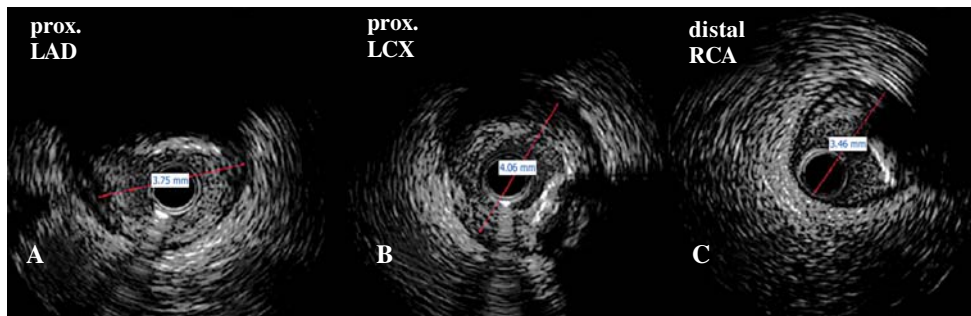


Figure 2. Intravascular ultrasound reveals a large amount of positive arterial remodeling and a reference diameter larger than that indicated by angiography in all three vessels: A – left anterior descending; B – left circumflex; C – right coronary artery.

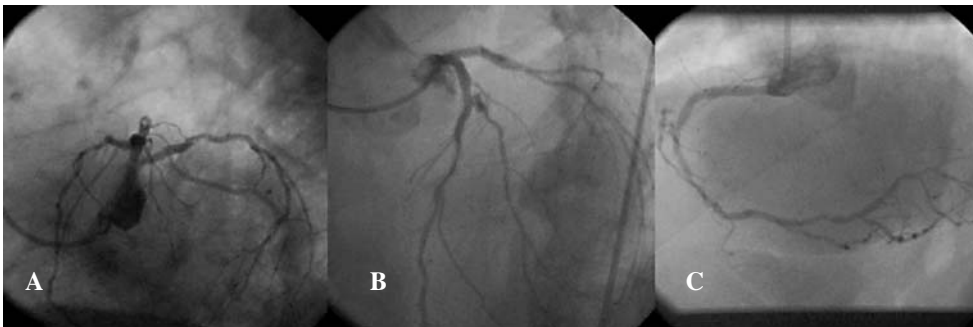


Figure 3. Stenting of the left anterior descending and left circumflex arteries (A,B) and in the right coronary artery (C), led to a very good angiographic result.

sclerotic coronary vessels (positive vessel wall remodeling) jeopardizes the validity of vessel size assessment based only on angiography. Intravascular ultrasound examination frequently reveals that coronary vessels are larger than they “look” angiographically. Upgrade of stent diameter selection in angiographically “small vessels” is one of the parameters favoring IVUS to improve clinical outcomes.^{3,4}

References

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