

Intravascular ultrasound imaging of angiographically normal coronary arteries: An in vivo comparison with quantitative angiography

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Abstract

Intravascular ultrasound, a new technique for real-time twodimensional visualization of arteries and veins, delineates vessel wall morphology and measures luminal dimensions. This imaging method has been validated with in vitro systems and in peripheral vessels, but there are few in vivo coronary artery studies.

Twenty cardiac transplant recipients with no angiographic coronary artery disease were scanned with a 30-MHz intravascular ultrasound catheter from the left main coronary ostium to the mid-left anterior descending coronary artery. Simultaneous angiographic measurements were performed at 76 sites. Ultrasound end-diastolic diameters in two perpendicular axes were 3.8 ± 0.9 and 3.9 ± 0.6 mm, respectively, and mean diameter derived from an area determined by planimetry was 3.9 ± 0.9 mm. Angiographic coronary artery diameters measured with a computer-assisted edge detection system perpendicular to the long axis of the vessel and to the long axis of the catheter were 3.4 ± 0.8 and 3.6 ± 0.8 mm, respectively.

Luminal diameters measured with the two imaging systems correlated closely, with an r value of 0.86 when ultrasound was compared with the angiographic diameter measured perpendicular to the vessel and 0.88 when compared with the angiographic diameter measured perpendicular to the imaging catheter. Eighty-three percent of the ultrasound-measured diameters were above the line of identity when compared with the simultaneous angiographic measurement. The more the imaging catheter deviated from the long axis of the vessel, the greater was the discrepancy between the ultrasound and angiographic measurements.

In summary, in vivo intracoronary ultrasound measurements correlate closely with quantitative angiography, although ultrasound measurements tend to be slightly larger. Correlation is improved when the ultrasound catheter is parallel to the vessel long axis. Eccentric ultrasound catheter placement does not have a significant effect on measurements in coronary vessels. Intravascular ultrasound provides an accurate method to assess coronary dimensions as an alternative to quantitative angiography.