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IMAGING VIGNETTE

Diagnostic Accuracy of CT Angiography to Assess Coronary Stent Thrombosis as Determined by Intravascular OCT

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CORONARY STENT THROMBOSIS REMAINS A POTENTIAL COMPLICATION AFTER STENT IMPLANTATION. Detection of intracoronary thrombus has been demonstrated with invasive imaging such as coronary angiography, intravascular ultrasound, angioscopy, and optical coherence tomography (OCT). Above all, OCT has an excellent diagnostic accuracy for intracoronary thrombus (1). However, OCT is a specialized research tool which requires complex procedures for image acquisition. Multidetector row computed tomography (MDCT) is a promising noninvasive method for the assessment of coronary artery disease (2). Recent technical improvements have significantly improved the potential of MDCT to visualize stents and assess the in-stent lumen. Although stent diameter, material, and design, as well as procedure characteristics substantially affect image analysis and interpretation, identification of luminal obstruction is usually possible in larger stents as long as the computed tomography (CT) dataset does not contain major artefacts. Thrombus will typically appear as a hypodense structure within the stent lumen. To evaluate diagnostic accuracy of MDCT for stent thrombosis, we performed 64-slice CT and OCT in 79 patients who presented at a mean interval of 24 h (18 to 43 h) after the onset of acute chest pain within 1 month after coronary stent implantation. Stent thrombosis was identified in 21 patients by OCT. CT correctly identified 20 patients with stent thrombosis but misclassified 5 patients: 4 patients with a false-positive interpretation of CT had stents with a diameter of 2.5 mm. One patient with a false-negative CT interpretation had a small thrombus with diameter <1.0 mm in OCT. The sensitivity, specificity, and positive and negative predictive values of CT for the identification of stent thrombosis were 95%, 93%, 83%, and 98%, respectively. Figures 1 and 2 show representative findings of stent thrombosis with incomplete occlusion, Figures 3 and 4 demonstrate complete thrombotic occlusion, and Figure 5 a false-positive CT dataset. It is important to be familiar with the described features, especially when considering CT imaging in patients with chest pain early after coronary stent implantation.
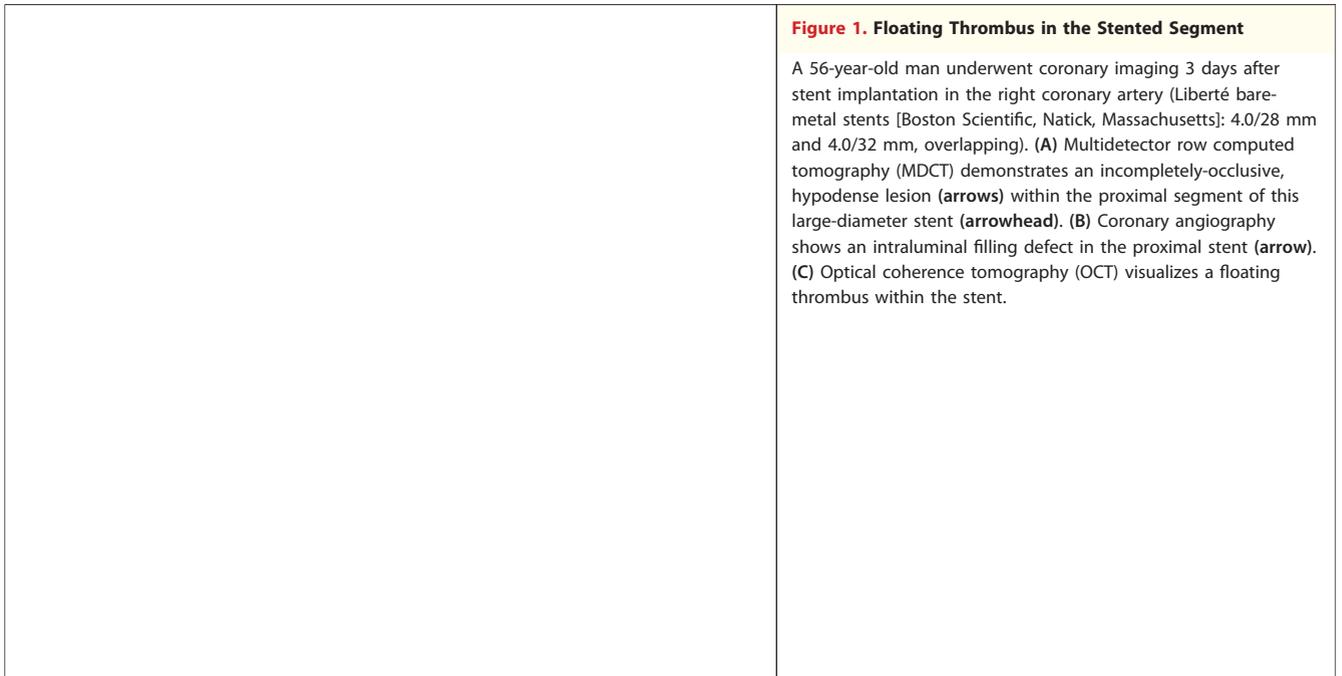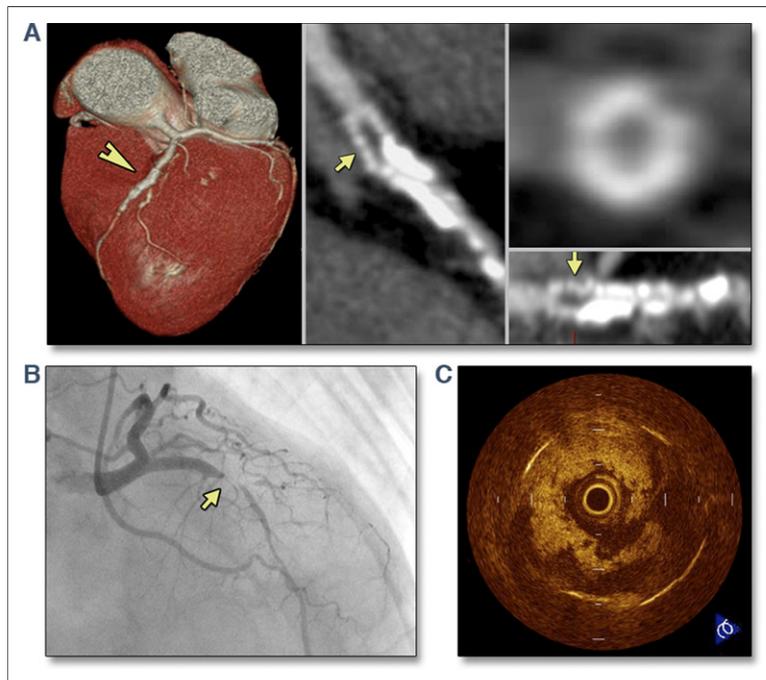
Figure 1. Floating Thrombus in the Stented Segment

A 56-year-old man underwent coronary imaging 3 days after stent implantation in the right coronary artery (Liberté bare-metal stents [Boston Scientific, Natick, Massachusetts]: 4.0/28 mm and 4.0/32 mm, overlapping). **(A)** Multidetector row computed tomography (MDCT) demonstrates an incompletely-occlusive, hypodense lesion **(arrows)** within the proximal segment of this large-diameter stent **(arrowhead)**. **(B)** Coronary angiography shows an intraluminal filling defect in the proximal stent **(arrow)**. **(C)** Optical coherence tomography (OCT) visualizes a floating thrombus within the stent.
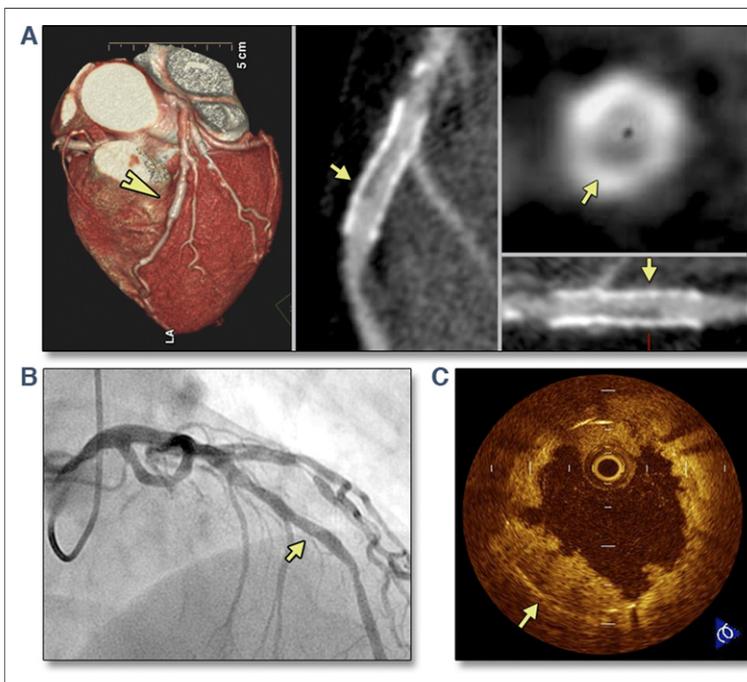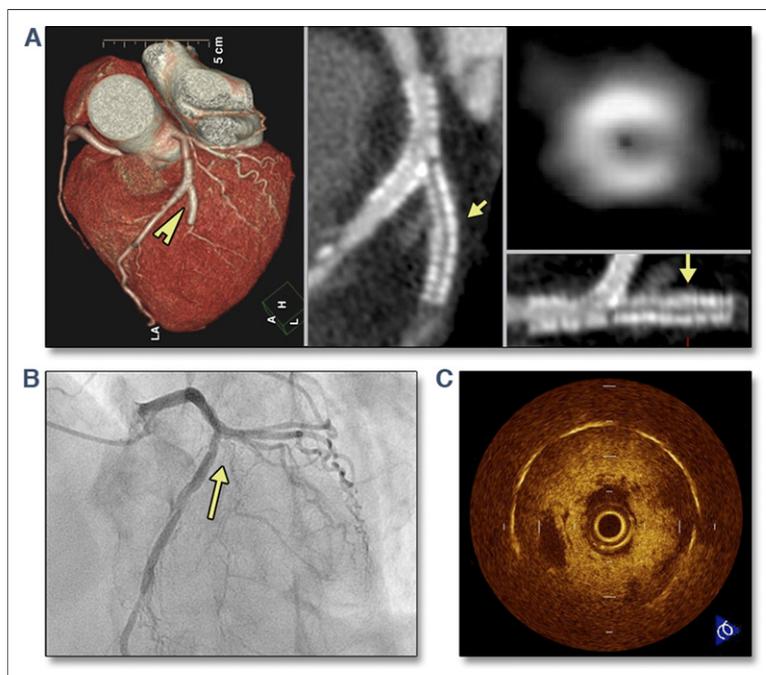

Figure 2. Mural Thrombus in the Stented Segment

A 71-year-old man underwent coronary imaging 27 days after stent implantation in the left anterior descending coronary artery (Taxus Liberté Paclitaxel-eluting stent [Boston Scientific]: 3.5/18 mm). **(A)** MDCT demonstrates a hypodense lesion **(arrows)** within the stent **(arrowhead)**. **(B)** Coronary angiography shows intraluminal haziness in the stent segment **(arrow)**. Again, the stent diameter is relatively large. **(C)** OCT visualizes a mural thrombus within the stent. Abbreviations as in Figure 1.
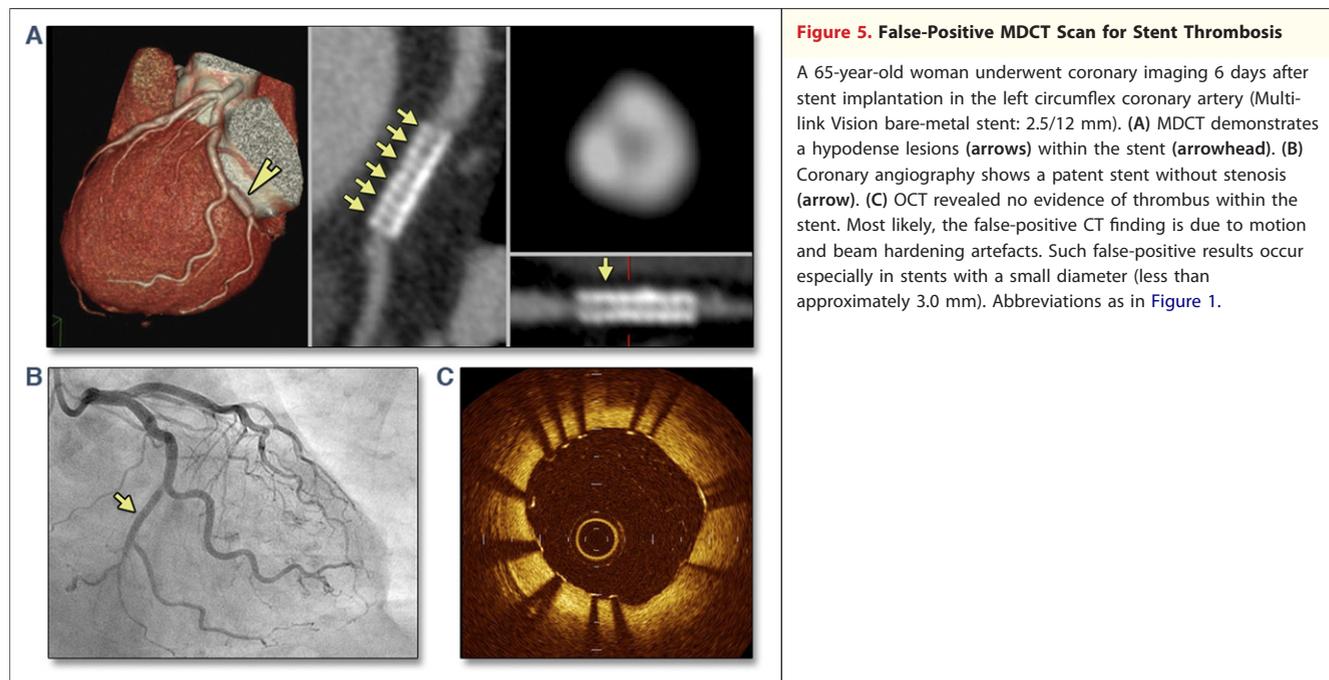
Figure 3. Obstructive Thrombus in the Stented Segment

An 81-year-old man underwent coronary imaging 25 days after stent implantation in the left anterior descending coronary artery (Multi-link Vision bare-metal stent [Abbott Vascular, Santa Clara, California]: 2.5/12 mm). **(A)** MDCT demonstrates an obstructive hypodense lesion **(arrows)** within the stent **(arrowhead)** which had been implanted in a calcified stenosis. **(B)** Coronary angiography shows severe obstruction of the stent **(arrow)** and impairment of coronary blood flow (Thrombolysis In Myocardial Infarction flow grade 1). **(C)** OCT visualizes a thrombus that occupied the lumen within the stent. Abbreviations as in Figure 1.

Figure 4. Occlusive Thrombus in the Stented Segment

A 65-year-old man underwent coronary imaging 12 days after treatment of a bifurcation lesion using T-stent technique (Multi-link Vision bare-metal stents [Abbott Vascular]: 3.0/18 mm in the left anterior descending coronary artery and 2.5/18 mm in the diagonal branch). **(A)** MDCT demonstrates an occlusive hypodense lesion **(arrows)** within the stent **(arrowhead)** in the diagonal branch. **(B)** Coronary angiogram shows occlusion of the stent in the diagonal branch **(arrow)**. **(C)** OCT visualizes an occlusive thrombus within the stent in the diagonal branch. Abbreviations as in Figure 1.

Figure 5. False-Positive MDCT Scan for Stent Thrombosis

A 65-year-old woman underwent coronary imaging 6 days after stent implantation in the left circumflex coronary artery (Multi-link Vision bare-metal stent: 2.5/12 mm). **(A)** MDCT demonstrates a hypodense lesions **(arrows)** within the stent **(arrowhead)**. **(B)** Coronary angiography shows a patent stent without stenosis **(arrow)**. **(C)** OCT revealed no evidence of thrombus within the stent. Most likely, the false-positive CT finding is due to motion and beam hardening artefacts. Such false-positive results occur especially in stents with a small diameter (less than approximately 3.0 mm). Abbreviations as in Figure 1.

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