Visualization of Neointima Formation by Optical Coherence Tomography

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SUMMARY

Optical coherence tomography (OCT) has recently been proposed as a high-resolution imaging method.1-5) The resolution of OCT was approximately 10 to 20 µm, which was about 10 times higher than that of IVUS.6) We also compared the image of neointima formation after stent implantation evaluated by histopathological examination with that evaluated by IVUS and OCT. OCT visualized well-apposed stent struts and neointima formation, which could not be visualized completely by IVUS. OCT may be useful for monitoring structural changes after stent implantation. (Int Heart J 2005; 46: 1133-1136)

Key words: Imaging, Coronary artery, Stent, Histology

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CASE REPORT

A 62-year-old male admitted to our hospital died 3 days after admission due to acute leukemia. When he was 57 years old, he underwent cardiac catheterization for unstable angina pectoris and a coronary angiogram revealed significant stenosis of the right coronary artery, which was treated with a 3.5 × 24 mm GFX stent (Medtronic Arterial Vascular Engineering, Inc). After he died, written informed consent was obtained from his family. The right coronary artery was removed at autopsy within 3 hours after death. The intravascular OCT catheter (ImageWire TM, LightLab Imaging, Westford, MA) and intravascular ultrasound (IVUS) (2.5F, 40-MHz, Boston Scientific, Natick, Massachusetts) were inserted...
Figure 1. Intravascular ultrasound showed a well-deployed stent and neointima formation.

Figure 2. Optical coherence tomography (OCT) showed well-apposed stent struts and neointima formation around stent was clearly visualized.

into the right coronary artery and serial OCT and IVUS images were obtained using an automatic pullback device at a rate of 0.5 mm/s. After imaging, the right coronary artery was pressure perfusion-fixed in 10% formalin and examined by
Observations during OCT, IVUS, and histopathology were performed on corresponding sites at the same distance from the stent edge. IVUS showed a well-deployed stent and visualized the neointima formation (Figure 1). On the other hand, OCT showed well-apposed stent struts and neointima formation around the stent was more clearly visualized (Figure 2). Histopathology also showed neointima formation (Figure 3).

**DISCUSSION**

OCT is a recently developed optical imaging technique that provides high-resolution cross-sectional images of a vessel. OCT has some limitations in clinical situations, one of which is the reduced effectiveness associated with imaging through blood. Therefore, it is necessary to establish a blood-free environment for OCT light penetration to the vessel wall. Jang, et al demonstrated the feasibility of OCT in visualizing coronary plaques in vivo using a saline flush method, which is a technique commonly practiced in angioscopy. Using such a technique combined with balloon occlusion, visualizing the vessel wall may be possible in vivo. However, if OCT is to be used in vivo, heart motion artifacts might represent a potential limitation. Another limitation is the limited depth of penetration of OCT. The maximum depth of penetration of the OCT was approximately 2.0 mm from the center of the OCT catheter. However, the current capabilities of OCT are well suited for the identification and study of neointima formation, where the relevant morphologic features are primarily localized within 500 μm of the luminal
In the near future, OCT might be used to monitor the structural changes that occur with neointima formation after implantation of a drug-eluting stent.

REFERENCES