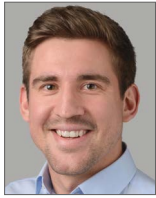# Correlation of near-infrared spectroscopy, optical coherence tomography and post-mortem histology for lipid detection

Christian Zanchin[1], MD, PhD; Lucine Christe[2], MD; Lorenz Räber[1]*, MD, PhD

1. Department of Cardiology, Bern University Hospital, University of Bern, Bern, Switzerland; 2. Institute of Pathology, University of Bern, Bern, Switzerland
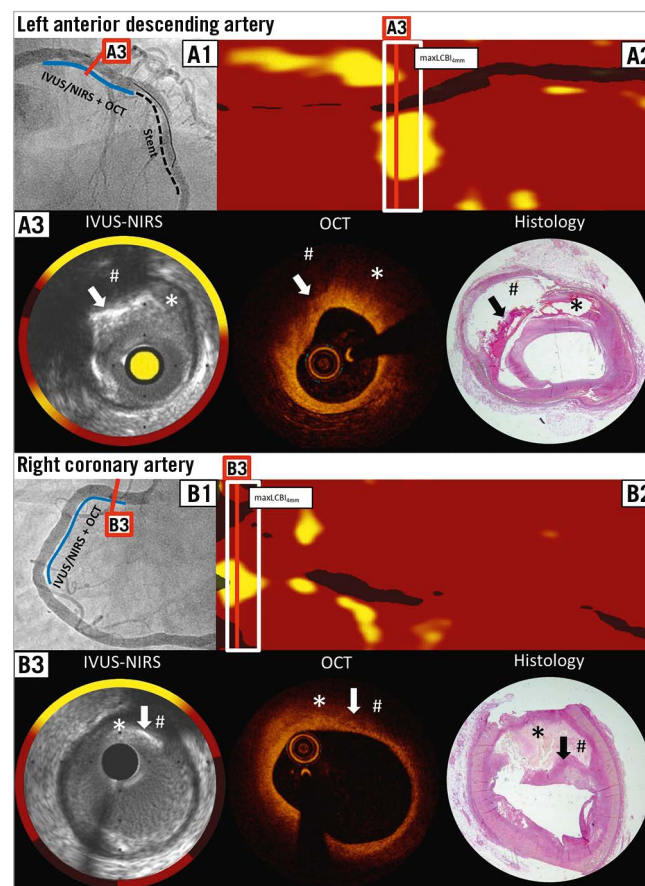
Figure 1. *Matched near-infrared spectroscopy and optical coherence tomography cross-sections with post-mortem histopathology specimens. A1) & B1) Angiography of the LAD and RCA, respectively. A2) & B2) NIRS chemogram of the LAD and RCA, respectively. The red line indicates where lipid accumulation was maximal according to the NIRS-derived chemogram within the maxLCBI$_{4mm}$ segment and where matching with OCT and post-mortem histology was performed. A3) & B3) Matched IVUS-NIRS, OCT and post-mortem histology cross-sections. The asterisk marks the lipid pool. The arrow points to the calcium to confirm appropriate matching. Histopathology specimen confirmed NIRS-detected lipid behind the calcium, which could not be detected by OCT (hashtag). B3) Histopathology cross-section. The calcific tissue is not clearly demarcated by histology and can only vaguely be discerned (arrow). The fibrous cap is ruptured during the fixation process, suggesting a much bigger plaque burden than in IVUS and OCT, and the lumen contour remains elusive.*

*Corresponding author: Department of Cardiology, Bern University Hospital, Freiburgstrasse 18, 3010 Bern, Switzerland.
E-mail: lorenz.raeber@insel.ch*

A 67-year-old female presented with an acute anterior ST-elevation myocardial infarction (STEMI) and underwent percutaneous coronary intervention (PCI) of the mid-left anterior descending (LAD) coronary artery. Following successful implantation of two drug-eluting stents with Thrombolysis In Myocardial Infarction (TIMI) grade 3 flow, multimodality imaging using near-infrared spectroscopy with intravascular ultrasound (NIRS-IVUS) and optical coherence tomography (OCT) was performed in the LAD and right coronary artery (RCA) in the setting of an imaging study **(Figure 1A1, Figure 1B1)**.

The NIRS chemogram of the LAD and RCA showed two lipid-rich plaques (LRPs). The 4 mm segment with the maximum amount of lipid (maxLCBI$_{4mm}$) was 488 in the LAD and 309 in the RCA **(Figure 1A2, Figure 1B2)**. Matched OCT and IVUS of the NIRS-detected LRPs of the LAD and RCA showed a fibroatheroma with a fibrous cap thickness of approximately 300 μm and a plaque burden of 76% in the LAD, and a fibroatheroma with a fibrous cap thickness of approximately 350 μm and a plaque burden of 40% in the RCA **(Figure 1A3, Figure 1B3)**. Of note, the calcification challenges the lipid detection by OCT and should not be misinterpreted as lipid (arrow).

The further course was uneventful until day 5 when the patient suffered from pulseless electrical activity. Immediate cardiopulmonary resuscitation was unsuccessful; an autopsy was performed confirming a ventricular myocardial rupture with cardiac tamponade as the immediate cause of death. The previously imaged vessels were further examined by histology (Verhoeff-van Gieson stain). Matched post-mortem histology cross-sections showed two LRPs, confirming the previous assessment by *in vivo* intracoronary imaging **(Figure 1A3, Figure 1B3)**.

This cardiovascular flashlight uniquely confirms the good concordance between NIRS, OCT and post-mortem histopathology for lipid detection but also illustrates challenges in the differentiation between lipid and calcium.

Conflict of interest statement