

Title: Correlation between *in vivo* near-infrared spectroscopy and optical coherence tomography detected lipid-rich plaques with post-mortem histology.

Authors: Christian Zanchin, M.D; Lucine Christe, M.D; Lorenz Räber, M.D, PhD

DOI: 10.4244/EIJ-D-19-775

Citation: Zanchin C, Christe L, Räber L. Correlation between *in vivo* near-infrared spectroscopy and optical coherence tomography detected lipid-rich plaques with post-mortem histology. *EuroIntervention* 2019; Jaa-678 2019, doi: 10.4244/EIJ-D-19-775

Manuscript submission date: 22 August 2019

Revisions received: 07 November 2019

Accepted date: 08 November 2019

Online publication date: 12 November 2019

Disclaimer: This is a PDF file of a "Just accepted article". This PDF has been published online early without copy editing/typesetting as a service to the Journal's readership (having early access to this data). Copy editing/typesetting will commence shortly. Unforeseen errors may arise during the proofing process and as such Europa Digital & Publishing exercise their legal rights concerning these potential circumstances.

Correlation between *in vivo* near-infrared spectroscopy and optical coherence tomography detected lipid-rich plaques with post-mortem histology

Christian Zanchin¹, MD; Lucine Christe², MD; Lorenz Räber¹, MD, PhD

1. Swiss Cardiovascular Center Bern, Department of Cardiology, Bern University Hospital, Bern, Switzerland
2. Institute of Pathology, University of Bern, Switzerland

Author for correspondence:

Prof. Lorenz Räber, MD, PhD

Department of Cardiology

Bern University Hospital

3010 Bern, Switzerland

e-mail: lorenz.raeber@insel.ch

Conflict of interest: LR received research grants by Abbott and Infraredx and speaker fees by Abbott. The other authors report no conflicts of interest.

Classifications: Intravascular ultrasound, optical coherence tomography, other imaging modalities

Short title: Correlation of LRPs by NIRS, OCT, and histology

A 67-year-old female presented with an acute anterior STEMI and underwent percutaneous coronary intervention of the mid-left anterior descending (LAD) coronary artery. Following successful implantation of two drug-eluting stents with TIMI III 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 (A1 and B1).

The NIRS-chemogram of the LAD and RCA showed two lipid-rich plaques (LRPs). The 4mm segment with the maximum amount of lipid (maxLCBI_{4mm}) was 488 in the LAD and 309 in the RCA, respectively (Panel A2 and B2). Matched OCT and IVUS of the NIRS-detected LRPs of the LAD and RCA showed a fibroatheroma with a fibrous cap thickness of approximately 300µm and a plaque burden of 76% in the LAD and a fibroatheroma with a fibrous cap thickness of approximately 350µm and a plaque burden of 40% in the RCA (A3 and B3). 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 and 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) and showed two LRPs, confirming the previous assessment by in-vivo intracoronary imaging (A3 and B3).

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.

Figure legend

A1 and B1: Angiography of LAD and RCA, respectively.

A2 and B2: NIRS-chemogram of LAD and RCA, respectively. The red line indicates where lipid accumulation was maximal according to chemogram and matching with OCT and post-mortem histology was performed.

A3 and 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 be estimated (arrow). The fibrous cap is ruptured during the fixation process, pretending a much bigger plaque burden than in IVUS and OCT and the lumen contour remains elusive.

