# Cholesterol crystals identified using optical coherence tomography and virtual histology intravascular ultrasound

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The deposition and accumulation of lipid within the arterial wall leads to the development and progression of atherosclerotic plaques. Cholesterol crystals (CCs) are formed from these lipid pools and both augment the inflammatory response and promote plaque rupture, possibly through inducing mechanical instability. Accordingly, identification of these structures is important for plaque risk stratification.
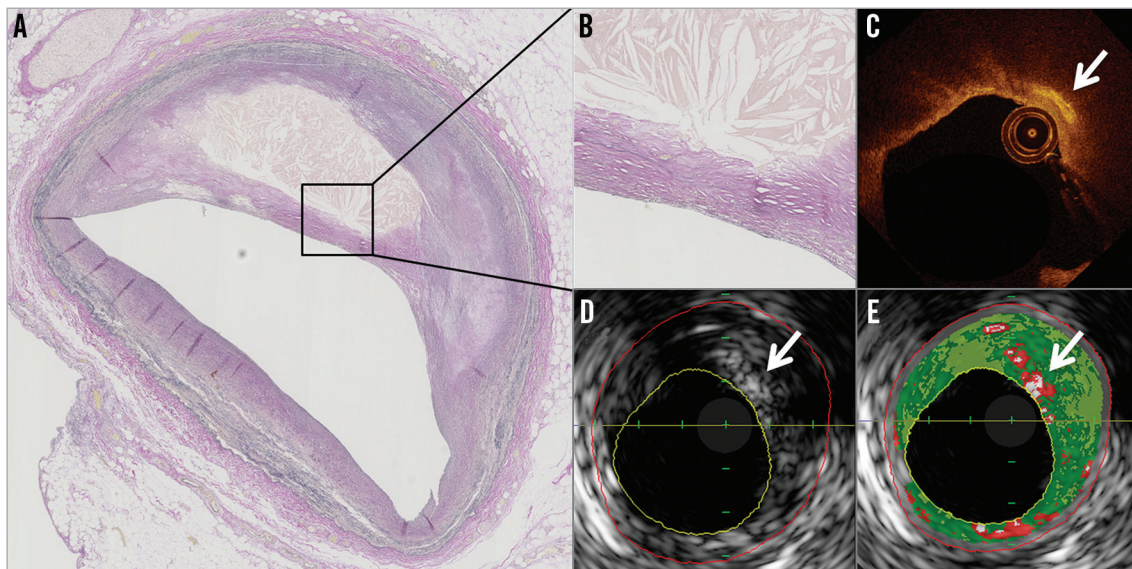
Optical coherence tomography (OCT) and virtual histology intravascular ultrasound (VH-IVUS) are invasive imaging modalities that permit plaque characterisation. Validation studies using these techniques have demonstrated their reliability to identify plaque constituents, including lipid and calcification. CCs are thought to be identifiable on OCT as linear, high-backscattering structures within fibroatheroma. However, OCT validation studies on CCs are lacking and their appearance on VH-IVUS unknown.

Here we present co-registered OCT (C7 Dragonfly™; St. Jude Medical, St. Paul, MN, USA) and VH-IVUS (Eagle Eye® Gold; Volcano Corporation, Rancho Cordova, CA, USA) images obtained from a human coronary artery imaged *ex vivo* on a proprietary pressure-perfused imaging rig **(Figure 1)**. Consistent with previous experience, CCs **(Figure 1A, Figure 1B)** were clearly identified by OCT as bright, high-backscattering structures located within a lipid-rich plaque **(Figure 1C)**. In contrast, on co-registered IVUS imaging, CCs resulted in a region of echogenic reflectivity **(Figure 1D)**, which led to them being characterised as dense calcium by VH-IVUS spectral analysis **(Figure 1E)**.

These images suggest that OCT offers improved diagnostic plaque characterisation compared with VH-IVUS for identification of cholesterol crystals in plaques.

## Conflict of interest statement

The authors have no conflicts of interest to declare.



**Figure 1.** *Co-registered images demonstrating cholesterol crystals on both optical coherence tomography and virtual histology intravascular ultrasound. An advanced atherosclerotic coronary lesion visualised by histology (A and B) with evidence of cholesterol crystals (arrows), identified by optical coherence tomography (C), greyscale intravascular ultrasound (D) and virtual histology intravascular ultrasound (E).*

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