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# Quantification of macrophage presence and identification of thin-cap fibroatheroma by optical coherence tomography image: histopathological validation study

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**Background:** Intracoronary optical coherence tomography (OCT) is thought to be capable of identifying a vulnerable, rupture-prone plaque based on the presence of a thin-cap fibroatheroma (TCFA). Moreover, recent studies have reported that OCT may be able to identify macrophage infiltration of the fibrous cap, a key characteristic of vulnerable plaque.

**Purpose:** This study evaluated the accuracy of OCT image for characterizing TCFA and identifying macrophage infiltration in comparison with histopathology.

**Methods:** A total of 924 focal plaques in 206 coronary arteries from 78 autopsy hearts were examined to compare OCT and histological images. By histology, 16 plaques (1.7%) were classified as TCFAsthat contained a large necrotic core covered by a thin ($<65\mu m$) fibrous-cap. Correlating OCT-histological sections were identified and OCT-derived tissue property indexes named normalized standard deviation (NSD) and signal attenuation ratio were applied on the fibrous-cap to identify inflamed fibrous-cap defined as a macrophage percentage $>10\%$ by histology.

**Results:** With histology as standard, the sensitivity, specificity, and negative-predictive-value of TCFAs were extremely high (more than 90%). However, the positive-predictive-value of TCFAs was only 32%, which indicated a high proportion of false-positives. Most false-positive diagnoses of OCT for TCFAs contained large amounts of foam cell accumulations on luminal surface without necrotic core. Twelve of 16 fibrous-caps were considered as inflamed and the remaining 4 were non-inflamed on histology. However, no significant difference in NSD and signal attenuation ratio were identified between them. There was moderate correlation of the fibrous-cap thickness between OCT and histology ($r2 = 0.41$ and $p<0.01$).

**Conclusions:** OCT is a promising intracoronary imaging modality for differentiating tissue characteristics (fibrous, calcified, or lipid-rich plaque) and identifying TCFA. However, it is still challenging to precisely identify inflammation, fibrous-cap thickness, and necrotic core in the native coronary artery. Therefore, careful interpretation is required to assess coronary vulnerable plaque by OCT.