Ex vivo evaluation of coronary atherosclerotic plaques: characterization with dual-source CT in comparison with histopathology

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BACKGROUND
Identification and differentiation of coronary atherosclerotic plaques may improve risk stratification for incident coronary events.

OBJECTIVE
We investigated the ability of dual-source computed tomography (CT) to depict and characterize atherosclerotic coronary plaques.

METHODS
Contrast-enhanced CT was performed in 25 human heart specimens with a total of 322 histologically determined plaques. Coronary plaques were classified on CT as (1) noncalcified, mixed, or calcified and (2) by CT attenuation values. Atherosclerotic plaques were histopathologically characterized according to the Stary classification.

RESULTS
CT detected 79% (245/322) of all plaques. Lesions missed by CT were generally early lesions, type I (n = 31), type II (n = 38), or type III (n = 8), according to Stary. CT detected 29% of early (Stary I-III) and 100% of advanced (Stary IV-VIII) plaques. Plaque classification as noncalcified was sensitive (100%) and specific (72%) for early, whereas classification as mixed/calcified was sensitive (92%, 89%) and specific (100%) for advanced plaques. Calcified plaques on CT were detected with high sensitivity (80%) and specificity (95%). Other subtypes were not distinguishable with CT according to the presence or absence of calcification. CT density was significantly higher for advanced (306 ± 470 HU) than for early (42 ± 14 HU; P < 0.01) plaques. The mean CT density value of type VII plaques (512 ± 349 HU) was significantly higher than those of other plaques (34-101 HU; P < 0.001).

CONCLUSIONS
CT reliably depicts advanced coronary plaques and allows for the differentiation between early and advanced plaques.