Title

Percent atheroma volume: Optimal variable to report whole-heart atherosclerotic plaque burden with coronary CTA, the PARADIGM study

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Compositional differences in atherosclerosis between the major epicardial arteries; a secondary analysis from the PARADIGM (Progression of Atherosclerotic Plaque Determined by Computed Tomographic Angiography Imaging) study.

Background. Atherosclerotic plaques in the left circumflex artery (LCx) are associated with lower a lower risk of future events than plaques in the right coronary artery (RCA) and left anterior descending artery (LAD). High risk plaque subtypes including necrotic core and fibrofatty plaque can be evaluated on computed coronary tomography angiography (CCTA) by Hounsfield Unit (HU) density. To date, little is known regarding differences in high risk plaque composition between major epicardial vessels.

Purpose. The aim of this analysis was to compare plaque extent and composition between the three coronary arteries.

Methods. This is a secondary analysis of baseline scans from the PARADIGM study which enrolled consecutive patients with suspected coronary artery disease undergoing serial CCTA at a scan interval of ≥ 2 years. Plaque quantification by composition was performed in the three coronary arteries based on fixed HU thresholds: high risk subtypes consisting of necrotic core (<30 HU) and fibrofatty plaque (31-130 HU), and other subtypes including fibrous (131-350 HU) and calcified plaque (≥351 HU). Comparisons between the coronary arteries were made using Generalized Estimating Equations (GEE) models, accounting for within-patient clustering of the coronary arteries and adjusting for ASCVD risk score and diabetes mellitus.

Results. From 1,271 patients (mean age 60.3±9.3 years; 57% men; median ASCVD score 9.3%), 3,813 vessels were analyzed. The prevalence of any plaque was lowest in the LCx, as was the prevalence of high risk plaque (**Figure; P <0.001 for both**). The share of total plaque volume made up by high risk plaque subtypes was the lowest in the LCx (17.3% versus 22.5% [RCA] versus 24.4% [LAD]; P <0.001). Contrastingly, calcified plaque made up the largest proportion in the LCx (44.5% versus 35.6% [RCA] versus 34.9% [LAD]; P <0.001).

Conclusion. Prevalence of any plaque as well as high risk plaque subtypes was significantly higher in the LAD and RCA than in the LCx. Also, high risk plaque subtypes made up significantly the lowest proportion in the LCx,

whereas calcified plaque made up the largest proportion in the LCx. These data support a different atherogenic milieu contributing to the variable risk patterns between the epicardial coronary arteries.

Figure. Prevalence of (high risk) plaque in the coronary arteries.

Plaque prevalence:

LAD — 30.2%, 64.4%, 5.4%

RCA — 34.3%, 60.2%, 5.5%

LCX — 20.9%, 8.9%, 70.2%

Vessels with:
- No plaque
- High risk plaque not present
- High risk plaque present