BACKGROUND: We evaluated the relationship between coronary calcium score by cardiac computed tomography angiography (CCTA) and plaque components by virtual histology-intravascular ultrasound (VH-IVUS) in patients with coronary artery disease (CAD).

METHODS: A 106 CAD patients with 170 coronary lesions who underwent CCTA were enrolled retrospectively and plaque components were analyzed using VH-IVUS. Coronary calcium score was assessed according to Agatston scoring method by CCTA: Group I [calcium Score = 0 (n=34)]; Group II [calcium Score = 1-100 (n=56)]; Group III [calcium Score = 101-400 (n=69)]; Group IV [calcium Score > 400 (n=11)]. VH-IVUS classified the color-coded tissue into four major components: fibrotic; fibro-fatty; dense calcium (DC); and necrotic core (NC).

RESULTS: At the minimum lumen site, the percent DC area was greatest, in contrast the percent fibrotic area was smallest in Group IV (5.6±6.8% vs. 12.0±10.4% vs. 15.4±11.5% vs. 19.4±13.5%, p<0.001, and 63.1±14.7% vs. 56.6±13.9% vs. 49.6±13.3% vs. 50.1±15.4%, p=0.001, respectively). At the largest NC site, the percent DC area was greatest, and in contrast the percent fibrotic area was smallest in Group IV (7.9±6.9% vs. 15.6±9.8% vs. 16.7±9% vs. 23.8±9.4%, p<0.001, and 58.2±10.7% vs. 49.1±12.5% vs. 45.7±11.7% vs. 41.6±13.7%, p<0.001, respectively). The absolute DC and NC volumes were greatest, and percent DC volumes were greatest in Group IV (5.2±6.6 mm³ vs. 10.9±9.2 mm³ vs. 15.9±14.6 mm³ vs. 35±20 mm³, p<0.001, and 13.4±16.8 mm³ vs. 19.1±19.4 mm³ vs. 22.8±20.4 mm³ vs. 36.4±26.4 mm³, p=0.007, and 6.2±4.7% vs. 12.0±6.5% vs. 13.8±7.1% vs. 21.3±7.1%, p<0.001, respectively). The absolute plaque and DC and NC volumes and the percent DC volumes positively correlated with calcium score (r=0.233, p=0.002, r=0.539, p<0.001, r=0.301, p<0.001, and r=0.450, p<0.001, respectively).

CONCLUSIONS: CAD patients with high calcium score had more vulnerable plaque components (greater DC and NC-containing plaques) compared with those with low calcium score.