luminal area (MLA) ≤4mm², non-calculated VH-defined thin cap fibroatheroma (nVH-TCFA).

**Results:** 3.674mm of VH-IVUS pullback were studied. Stented plaque necrotic core area was higher in ACS patients (25% [18-28] vs. 19% [14-26], p = 0.04). None of the higher risk VH-IVUS features (PB ≥70%, MLA <4mm², nVHCTCFA) were more prevalent in ACS. Whole vessel and whole plaque Stress-P1 was similar between groups. Higher-risk plaque features decreased in ACS patients where MLA <4mm² (8.24 [7.06-9.93] vs. 7.72 [6.33-9.34], p = 0.03), PB >70% (9.18 [7.44-10.88] vs. 7.93 [6.16-9.46], p = 0.02) and ncVHCTFA (0.23 [7.33-11.44] vs. 7.65 [6.45-6.72], p = 0.02), and markedly increased for combinations (e.g. MLA≤4mm² and PB >70% (0.74 [0.27-1.70] vs. 7.74 [6.13-9.01], p < 0.009) and MLA≤4mm² and ncVHCTFA (8.73 [7.32-10.91] vs. 6.50 [5.83-7.53], p ≤ 0.004). There was a positive correlation between increasing luminal area and Stress-P1 (r = 0.39, p = 0.0001), but not with plaque burden (r = 0.03, p = 0.11). Stress-P1 increased the discriminatory power of nVH-IVUS to predict ACS (area under the curve 0.558 vs. 0.717, p = 0.027).

**Conclusions:** Higher-risk plaque features defined by VH-IVUS are associated with increased maximum Stress-P1 in ACS patients. Elevated plaque stress may determine whether a higher-risk plaque ruptures, and biomechanical modeling may increase the ability of VH-IVUS to predict plaque rupture.

**TCT-647**
Co-registration of Intravascular Ultrasound and Angiography
Andrew Cassar1, Megha Prasad1, Kenneth A. Fetterly1, Abhiram Prasad1, John Bresnahan1, Amir Lerman1
1Mayo Clinic, Rochester, MN

**Background:** Intravascular ultrasound (IVUS) provides cross sectional imaging of coronaries but lacks overview of the vascular territory provided by angiography. We studied the feasibility of automated co-registration of angiography and IVUS to facilitate interrogation of the two imaging modalities in a synchronous manner.

**Methods:** 49 consecutive patients undergoing surveillance for cardiac allograft vasculopathy with angiography and IVUS of the left anterior descending artery (LAD) were enrolled. A pre-IVUS angiogram of the LAD was performed followed by an ECG triggered fluoroscopy (ECGFT) during IVUS pullback (Eagle Eye Platinum [Volcano Corp.] at 0.5mm/s using an automatic pullback device. ECGFT was used to track the IVUS catheter during pullback and establish a spatial relationship to the pre-IVUS angiogram. Anglo-IVUS co-registration was performed with a research prototype (Siemens Healthcare, Germany) and accuracy evaluated by distance mismatch between angiography and IVUS images at vessel bifurcations (Figure A).

**Results:** The median (IQR) co-registration distance mismatch measured at 108 bifurcations in 42 (85%) patients was 0.35 (0.00-1.16) mm (Figure B). 7 patients were excluded due to inappropriate data acquisition (n=3) and failure of tracking (n=4); e.g. due to overlapping stent wires. Estimated effective radiation dose for ECGFT was 0.09mSv.

**Conclusions:** This study demonstrates the feasibility of angiog-VUS co-registration which may be used as a clinical tool for localizing IVUS cross sections along an angiographic roadmap.

**Supporting File(s):** Location: https://www5.aievolution.com/tct2013/files/content/abstracts/abs_1794/mic_for_pub.jpg

**TCT-648**
Coronary Atheroma Composition Predicts Endothelial Dysfunction in Non-ST Segment Elevation Myocardial Infarction: Novel Insights with Radifrequency (iMAP) Intravascular Ultrasound (IVUS)
Bishu Pari1, Stephen J. Nicholls1, Danielle Brennan1, Jordan Andrews1, Gary Liew2, Rishi Puri1, Stephen J. Nicholls1, Danielle Brennan1, Jordan Andrews1, Gary Liew2
1Royal Adelaide Hospital, Adelaide, Sth Australia, 2University of Adelaide, Adelaide, Sth Australia, 3Royal Adelaide Hospital, Adelaide, Sth Australia, 4Cleveland Clinic, Cleveland, Cleveland, OH, 5University of Adelaide, Adelaide, Sth Australia, 6Cleveland Clinic Cleveland, Cleveland, Ohio

**Background:** Coronary atheroma composition and endothelial dysfunction are each known to associate with incident coronary events, yet little is known about their associate with segmental endothelial dysfunction, providing a mechanistic link between atheroma composition and lumen reactivity, and thus potential ‘vulnerability’ for a clinical event.

**Methods:** To evaluate the relationship of plasma hs-CRP level with venous IVUS plaque composition of the coronary arterial tree, we performed ‘whole vessel’ virtual histology-intravascular ultrasound (VH-IVUS) in 189 vessels of 63 patients. The components of atherosclerosis were classified as fibrous (FI), fibrous-fatty (FF), plaque independently associated with segmental vasoconstruction (β = 1.2, p = 0.023; 95% CI: 0.026–2.401, p = 0.027).

**Conclusions:** Following NSTEMI, both lipidic and necrotic plaque content each associate with segmental endothelial dysfunction, providing a mechanistic link between atheroma composition and lumen reactivity, and thus potential ‘vulnerability’ for a clinical event.