Vector flow imaging of the ascending aorta. Are systolic backflow and atherosclerosis related?

In the ascending aorta, atherosclerotic plaque formation, which is a risk factor for cerebrovascular events, most often occurs along the inner curvature. Atherosclerosis is a multifactorial disease, but the predilection site for the aortic vessel degradation is probably flow dependent. To better understand the aortic flow and especially the complex flow patterns, the ascending aorta was scanned intraoperatively in patients undergoing heart surgery using the angle-independent vector velocity ultrasound method Transverse Oscillation (TO). The primary aim of the study was to analyze systolic backflow in relation to atherosclerosis. Thirteen patients with normal aortic valves were included in the study. TO implemented on a conventional US scanner (ProFocus 2202 UltraView, BK Medical, Herlev, Denmark) with a linear array transducer (8670, BK Medical, Herlev, Denmark) was used intraoperatively on the ascending aorta in long axis view. The presence of systolic backflow, visualized with TO, was correlated to aortic atherosclerosis, to systolic velocities obtained with transesophageal echocardiography and cardiac output obtained with pulmonary artery catheter thermodilution, to gender, age, aortic diameter, left ventricular ejection fraction (LVEF) and previous myocardial infarctions (MI). Systolic backflow in the ascending aorta was present for 38% (n=5) of the patients. The location of the backflow was strongly associated to the location of the plaques (p<0.005), and backflow was associated to high systolic velocities (p<0.05). The other obtained parameters were not associated to systolic backflow. It was shown that systolic backflow is a common flow feature in the ascending aorta, and that backflow is associated to atherosclerotic plaques and systolic velocities. The study indicates that vector flow imaging using TO can provide important blood flow information in the assessment of atherosclerosis.