

AbstractID: 7374 Title: Development of cardiac-gated 3-dimensional ultrasound imaging of carotid atherosclerosis

Purpose: To determine the time interval in the cardiac cycle for prospectively gated ultrasound imaging of the carotid artery that will reduce change in cross-sectional lumen area to 5%.

Method and Materials: Three female subjects (ages 26-46) were used for this pilot study. The ultrasound transducer was placed over the left common carotid artery in the transverse orientation. Images and electrocardiogram values were recorded by in-house 3-dimensional ultrasound acquisition software. The lumen of the common carotid artery was outlined by one observer using manual segmentation at 66 ms intervals and the area of each outline was calculated by in-house software; this was repeated 3 times.

Results: The mean change in lumen area was $(15 \pm 2)\%$. A change in lumen area of 5% was selected as the desired change after prospective gating. At systole, the interval of the cardiac cycle for 5% change was 0.19 ± 0.05 to 0.54 ± 0.08 for subject 1, 0.26 ± 0.06 to 0.67 ± 0.07 for subject 2, and 0.6 ± 0.4 to 1.0 ± 0.4 for subject 3. At diastole, the interval was 0.77 ± 0.05 to 1.15 ± 0.06 for subject 1, 0.77 ± 0.09 to 1.20 ± 0.08 for subject 2, and 0.6 ± 0.2 to 0.9 ± 0.2 for subject 3. For both diastolic and systolic intervals, there was no significant ($p < .05$) difference between the start and end of the intervals for subjects 1 and 2, but the interval for subject 3 was significantly different from both.

Conclusion: We have combined ultrasound imaging and data from an ECG to measure the effect of cardiac cycle on lumen cross-sectional area. The lumen area of the common carotid artery changed by 15% over the cardiac cycle. No consistent interval was found to reduce this area change to 5% for prospective gating.