

1056-92-417

Chun Yang* (yangchun@bnu.edu.cn) and **Dalin Tang** (dtang@wpi.edu), 100 Institute Road, Math Dept, Worcester, MA 01609, and **Gador Canton, Thomas S. Hatsukami and Chun Yuan.** *Human Carotid Plaque Progression Correlated Positively with Flow Shear Stress and Negatively with Plaque Wall Stress: 3D FSI Models Using Multi-Year Patient-Tracking In Vivo MRI.*

It is well-known that atherosclerotic plaque initiation and early progression correlate negatively with flow shear stresses (FSS). Mechanisms governing advanced plaque progression may be different due to changes in flow and plaque wall stress (PWS) environment. Multi-year in vivo MRI data were acquired from 6 patients with informed consent obtained. Each patient was scanned 3-4 four times (scan interval: 18 months). Fifteen time pairs were formed for analysis, with MRI slices matched (100 data points per slice). Plaque progression was defined as wall thickness increase (WTI) at each data point. 3D fluid-structure-interaction (FSI) models were constructed for each plaque and solved to obtain PWS and FSS at 700-900 data points per time pair. Using PWS and FSS values from the "current" scan, 12 out of 15 time-pairs showed negative correlation between PWS and WTI (mean Pearson correlation coefficient $r = -0.253$). Ten out of the 15 cases showed positive correlation between FSS and WTI (mean Pearson correlation coefficient $r = 0.208$). Results from this study indicated that correlations between plaque progression and mechanical FSS and PWS for advanced plaques may differ from that for plaques at earlier stage. This research was supported in part by NSF grant DMS-0540684. (Received September 05, 2009)