AbstractID: 10179 Title: Quantitative 3D Analysis of Stenosis Rate for Carotid Artery on CT Angiograms

Purpose: The diagnosis of arteriosclerosis is often based on the estimated quantities of carotid plaque. Computed tomography angiography (CTA) is an established examination method for depicting faint plaque and calcifications along the carotid vessel wall, although ultrasound imaging and magnetic resonance angiography also have been employed for this purpose. Our aim in this study was to develop a computerized method for quantifying carotid plaque and determining the stenosis rate by 3D analysis of the composition of the plaque volume. **Method and Materials:** Our scheme consisted of the following steps: 1) Manual drawing of the outlines of the vessel wall by an experienced physician, 2) quantitation of the vessel wall thickness, 3) volume measurements of a plaque by use of thresholding and shape analysis, 4) determination of the stenosis rate based on the volume ratio of blood flow to vessel caliber, and 5) 3D visualization of the vessel and plaque. The composition of plaques was classified into three categories based on the range of CT values as an initial estimate, i.e., lipid (-100 HU to 50 HU), hemorrhage (50 HU to 180HU), and calcification (500HU +). Shape analysis methods using a region growing technique were applied for segmentation of isolated regions such as calcifications. **Results:** We employed 70 CTA cases to determine the stenosis rate and to visualize the plaque composition. The results indicated that the visualization was very useful for understanding of the spatial composition of plaques and confirming the location of the stenosis relative to the vessel wall. **Conclusion:** The quantitative results obtained with the computerized scheme for characterization of carotid plaques on CTA would be useful for evaluation of the effect of treatment with minimally and non-invasive vascular procedures.