CORRELATION BETWEEN MICROWAVE RADIOMETRY TEMPERATURES AND INTRAPLAQUE NEOANGIOGENESIS VISUALIZED BY CONTRAST-ENHANCED CAROTID ULTRASOUND: A POPULATION STUDY

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Background: Recent histological and clinical studies have demonstrated the role of neoangiogenesis and inflammation in the development and progression of vulnerable atherosclerotic plaque (VP). Intraplaque neoangiogenesis can be visualized by contrast-enhanced carotid ultrasound (CEUS). Microwave Radiometry (MR), a new diagnostic non-invasive method, measures temperature of carotid plaques in vivo, reflecting the inflammatory activation. Although a correlation between neoangiogenesis and inflammation of VP has already been proved, a possible association of plaque temperature with neoangiogenesis remains unknown. We investigated in human carotid arteries whether thermal heterogeneity, measured by MR, was associated with ultrasound findings and intraplaque neoangiogenesis assessed by CEUS.

Methods: Nineteen consecutive patients admitted for screening for carotid artery disease, with intima-media thickness (IMT) ≥1mm in one or both carotid arteries, were included. Patients underwent basic ultrasound imaging, CEUS and MR assessment. Association of MR measurements with ultrasound findings and CE percentages was performed. Thermal heterogeneity (ΔT) was assigned as maximal temperature along the artery minus minimum. Contrast enhancement (CE) was defined as the % percentage of signal intensity difference, prior and post contrast infusion.

Results: Fatty plaques had higher ΔT compared to mixed and calcified (1.033 ±0.250 vs 0.700 ±0.254 vs 0.564 ±0.300°C, p<0.01). Plaques with irregular surface had higher ΔT compared to regular (0.800 ±0.173 vs 0.693 ±0.334°C). Heterogeneous plaques had higher ΔT than homogenous (1.033 ±0.250 vs 0.621 ±0.284°C, p<0.01). Mean ΔT detected by MR was higher in atherosclerotic carotid arteries with high CE (>10) compared to those with low CE (<10) (0.814±0.288 versus 0.400±0.185°C, p<0.01). Mean ΔT measured by MR showed good correlation with CE (p<0.01).

Conclusions: Microwave radiometry provides non-invasive temperature measurements of carotid plaques in vivo, which correlate well with ultrasound findings and contrast enhancement ultrasound percentages reflecting intraplaque neoangiogenesis.