Bilateral carotid intima media thickness (cIMT) and plaque measurements was stronger associated with cardiovascular risk factors than unilateral measurements. Results from the VIPVIZA trial

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Background: Clinical risk factors of cardiovascular diseases (CVD) are related to atherosclerosis and cIMT and plaque are signs of early atherosclerosis. However, associations between risk factors and ultrasound variables are not fully established and comparison between studies is hampered by different imaging protocols. There is limited data regarding study population characteristics and ultrasound measurements differ regarding arterial bed, projections, and plaque definitions and inclusion

Purpose: 1/ To describe the distribution of asymptomatic atherosclerosis as assessed by carotid ultrasound in a middle-aged population at low/intermediate risk of CVD. 2/ To investigate the associations between clinical risk factors and a set of ultrasound variables

Method: Bilateral carotid ultrasound examinations were performed according to a standardized protocol in 3532 healthy VIPVIZA-participants with at least one conventional CVD risk factor. CIMT was measured in the distal far wall of CCA, 240° and 210° left and 150° and 120° right side, based on Meijer arch. For each angle, mean and max IMT was measured in a 10 mm segment. Plaques were identified according to the Mannheim consensus. Socio-economic data was also recorded.

Associations between the risk factors and the set of ultrasound variables were quantified by a partial least squares (PLS) regression. A new compound ultrasound variable was computed, PLS UL, by combining all IMT variables and plaque using the weights of the first PLS component. In a second step, to estimate how much risk factors explained the variability of the ultrasound results, associations between risk factors and both PLS UL and single cIMT variables and plaque were determined using step-wise linear regression modelling

Results: Mean age was 55.6 and 55.8 years among men and women (52.7% women), 13% were smokers in both sexes, and 50.8% and 39.3%, respectively, had carotid plaque. Mean of mean cIMT was 0.68 mm vs 0.64 mm (p<0.001), and max cIMT was 0.90 mm vs 0.82 mm (p<0.001), respectively. Overall, cIMT was slightly higher in the left compared to the right carotid.

All ultrasound variables had similar univariate associations with clinical risk factors, positive associations for all risk factors except physical activity, fruit and vegetable consumption, education and HDL-cholesterol.

The strongest association between risk factors and ultrasound variables was found with PLS UL (R²=23%), compared to single cIMT variables (R²=14–18%) and plaque (R²=15%). The pattern was similar in both sexes with most risk factors shared between the sexes. The association with factors and PLS UL was stronger among 40-year olds (R²=22%) than among 50- and 60-year olds (R=12%)

Conclusion: A combination of ultrasound variables are stronger associated to CVD risk factors than plaque or a single CIMT measurement. The pattern is similar in men and women. These findings are relevant for development of a consensus for cIMT measurements.