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Assessment of carotid cross sectional area in hypertensive patients: phenotyping and prognostic validation in the campania salute network

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Background: Increased intima media thickness (IMT) of common carotid artery (CA) is considered the hallmark of vascular hypertension-mediated target organ damage, even though vessel remodeling due to mechanical stress can be accompanied also by changes in diameter.
Purpose: We developed a method computing both diameter and IMT of CA, and assessed correlates and prognostic impact of carotid cross sectional area (CCSA) in a large registry of treated hypertensive patients.
Methods: We selected 7049 hypertensive patients of the Campania Salute Network registry free of overt cardiovascular (CV) disease and with available CA ultrasound (54±11 yrs; 57% male). CCSA was computed as: $\pi \times [((\text{CA diameter} + 2 \times (\text{mean IMT})) / 2)]^2 - \pi \times [((\text{CA diameter}) / 2)]^2$.
Results: CCSA was considered high if >90th percentile of the sex-specific distribution (>48 mm^2 in men and >41 mm^2 in women). Higher CCSA correlated with older age, male sex, higher pulse pressure (PP), higher total and LDL cholesterol and presence of diabetes ($p<0.01$ for all). During a median follow-up of 45 months (IQR 19–92), 324 incident composite major and minor CV events occurred. In Cox regression analysis high CCSA was associated with more than 100% increased risk of incident CV events ($p<0.0001$, figure), independently of the effect of older age, male sex, PP>60mmHg, presence of left ventricular hypertrophy (LVH), carotid plaque (CP), and less anti-RAS therapy ($p<0.05$ for all).
Conclusions: In treated hypertensive patients, increased CCSA is associated with worse metabolic and lipid profile and predict incident CV events, independently of high PP, presence of LVH and CP.