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Molekulär Medicin och Kirurgi

Methodological studies applying new techniques for evaluation of arterial function

AKADEMISK AVHANDLING

som för avläggande av medicine doktorsexamen vid Karolinska Institutet offentligen försvaras i Thoraxaulan, N2:U1, Karolinska Universitetssjukhuset, Stockholm

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ABSTRACT

Atherosclerotic cardiovascular disease is the most common cause of death in the Western world today. Atherosclerosis in the arterial wall is related to aging and the inflammatory and calcification processes, and is influenced by risk factors such as smoking, male gender, diabetes, hypertension, obesity, stress, inactivity, hyperlipidemia, and genetic factors. Adequate diagnostic tools are needed for early detection and evaluation of treatment effects. The general aim of this thesis was to evaluate new and more established noninvasive techniques for measurement of arterial structure and function.

Methods: Study I measured carotid intima–media thickness (cIMT) in ultrasound recordings from 99 participants without known cardiovascular disease and compared the results between two semiautomated techniques: AMS and GE. In Study II aortic pulse wave velocity (PWVao) and aortic augmentation index (AIxao) were measured with Arteriograph and SphygmoCor in 63 (20–69 years old) healthy participants and compared the results between the newer technique and the more established technique. Study III evaluated the effects of vitamin D, parathyroid hormone, and calcium levels on vascular structure and function measured by different noninvasive techniques in 48 patients with mild primary hyperparathyroidism and 48 controls. In Study IV we investigated the effects of gender, insulin resistance, and low-intensity physical activity on vascular stiffness, structure, and function in 201 participants.

Results: The cIMT measured by GE was slightly but significantly higher than by AMS, but these correlated well in subjects without known cardiovascular disease (Study I). The Arteriograph gave higher PWVao values than the SphygmoCor, especially in women, while the correlation for AIxao between the methods was excellent. Arterial stiffness measured with both methods was related to age, cIMT and serum cholesterol level (Study II). PWVao, AIxao, cIMT, and radial artery IMT were related to systolic blood pressure but not to vitamin D level. (Study III). Greater arterial stiffness in women was indicated by AIxao, which was related to systemic vascular resistance and exercise capacity. However, a 4-month program of low-intensity physical activity did not improve vascular variables, and there were no gender differences in the responses to the exercise intervention (Study IV).

Conclusion: In follow-up studies and when evaluating treatment effects, it seems favourable not to change the techniques used to measure cIMT and to estimate stiffness. Neither vitamin D level nor low-intensity physical activity training influenced vascular morphology and function as evaluated by the applied noninvasive techniques.