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Original Article

Arterial Intima-Media Thickness, Endothelial Function, and Apolipoproteins in Adolescents Frequently Exposed to Tobacco Smoke

Katariina Kallio, MD, PhD; Eero Jokinen, MD, PhD; Maiju Saarinen, MSSc; Mauri Hämäläinen, PhD; Iina Volanen, MD, PhD; Tuuli Kaitosaari, MD, PhD; Tapani Rönnemaa, MD, PhD; Jorma Viikari, MD, PhD; Olli T. Raitakari, MD, PhD and Olli Simell, MD, PhD

From the Research Centre of Applied and Preventive Cardiovascular Medicine (K.K., M.S., I.V., T.K., O.T.R.) and the Departments of Pharmacology, Drug Development, and Therapeutics (I.V.), Medicine (T.R., J.V.), Clinical Physiology (O.T.R.), and Pediatrics (O.S.), University of Turku, Turku, Finland; the Department of Pediatrics, University of Helsinki, Helsinki, Finland (E.J.); and Joint Clinical Biochemistry Laboratory of University of Turku, Turku University Central Hospital and Wallac (M.H.), Turku, Finland.

Correspondence to **Katariina Kallio**, MD, PhD, Research Centre of Applied and Preventive Cardiovascular Medicine, University of Turku, Kiinamyllynkatu 10, FIN-20520 Turku, Finland. E-mail katariina.kallio@utu.fi

Background: Exposure to tobacco smoke is associated with markers of preclinical atherosclerosis in adults, but its effect on arterial structure in adolescents is unknown.

Methods and Results: Healthy 13-year-old adolescents from the atherosclerosis prevention trial STRIP were studied. Maximum carotid and aortic intima-media thickness and brachial artery flow-mediated dilation were measured in 494 adolescents using high-resolution ultrasound. Serum lipid, lipoprotein, and apolipoprotein (Apo) A-I and B concentrations were determined using standard methods. Exposure to tobacco smoke was measured annually between ages 8 and 13 years using serum cotinine concentrations, analyzed with gas chromatography. To define longitudinal exposure, cotinine values of children having serum cotinine measured 2 to 6 times during follow-up were averaged and divided into tertiles (exposure groups): low (n=160), intermediate (n=171), and high (n=163). Adolescents with higher longitudinal exposure to tobacco smoke had increased carotid intima-media thickness (exposure groups [mean±SD]: low, 0.502±0.079 mm; intermediate, 0.525±0.070 mm; high, 0.535±0.066 mm; $P<0.001$) and increased aortic intima-media thickness (exposure groups: low, 0.527±0.113 mm; intermediate, 0.563±0.139 mm; high, 0.567±0.126 mm; $P=0.008$). The flow-mediated dilation decreased when cotinine level increased (exposure groups: low, 10.43±4.34%; intermediate, 9.78±4.38%; high, 8.82±4.14%; $P=0.004$). Moreover, ApoB ($P=0.014$) and ApoB/ApoA-I ratio ($P=0.045$) increased with increase in cotinine level. The associations between tobacco smoke exposure and ultrasound variables were unchanged after adjusting for traditional atherosclerosis risk factors and for ApoB.

Conclusions: Frequent exposure to tobacco smoke is independently associated with arterial changes of preclinical atherosclerosis and increased ApoB levels among healthy adolescents.

Key Words: apolipoproteins • atherosclerosis • passive smoking • pediatrics • vasodilation