Interaction of Blood Pressure and LDL Cholesterol in Early Atherosclerosis. The Los Angeles Atherosclerosis Study

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Background. The response to injury model of atherosclerosis has been investigated in animal models but not in epidemiologic studies. Relations between LDL cholesterol and carotid intima-media thickness (IMT) within levels of SBP provide a test of this model.
Methods. Data are from a longitudinal study of 573 randomly sampled asymptomatic employees of a large company aged 40-60 years. IMT and change in IMT over 18 months (ΔIMT) were determined sonographically in the common carotid artery. 497 subjects were available for cross-sectional analysis. To investigate interactive effects of SBP and serum LDL on IMT, linear slopes ($\beta \pm$SE in mm/mmol/L) of IMT regressed on LDL were computed within SBP tertiles: Low 93-122, Middle 123-131, and High 132-175 mmHg. Covariates were age, body height, sex, body mass index, ethnicity, diabetes, smoking status, and treatment for hypertension or hypercholesterolemia. Analysis of ΔIMT in 414 subjects was similar.
Results. In cross-sectional models, IMT was positively related to LDL in the high SBP group (β=0.028±.008, p=0.0006), but not in the middle (β=-0.005±.008, p=0.51) or low (β=-0.003±.009, p=0.78) SBP groups. These differences in slope between SBP groups were statistically significant (p=0.004 for high vs middle, p=0.011 for high vs low). Results were comparable for the longitudinal analysis: ΔIMT was significantly related to LDL in the high SBP group (β=0.013±.005, p=0.009), but not in the middle (β=-0.006±.005, p=0.18) or low (β=-0.005±.005, p=0.31) groups. The differences in slope between SBP groups were again significant (p=0.005 and p=0.010, respectively).
Conclusion: These cross-sectional and longitudinal findings are consistent with the hypothesis that wall injury due to elevated SBP increases the susceptibility of the artery wall to LDL induced atherogenesis.