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## Association between multiple cardiovascular risk factors and atherosclerosis in children and young adults. The Bogalusa Heart Study.

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**BACKGROUND:** In adults, cardiovascular risk factors reinforce each other in their effect on cardiovascular events. However, information is scant on the relation of multiple risk factors to the extent of asymptomatic atherosclerosis in young people.

**METHODS:** We performed autopsies on 204 young persons 2 to 39 years of age, who had died from various causes, principally trauma. Data on antemortem risk factors were available for 93 of these persons, who were the focus of this study. We correlated risk factors with the extent of atherosclerosis in the aorta and coronary arteries.

**RESULTS:** The extent of fatty streaks and fibrous plaques in the aorta and coronary arteries increased with age. The association between fatty streaks and fibrous plaques was much stronger in the coronary arteries ( $r=0.60$ ,  $P<0.001$ ) than in the aorta ( $r=0.23$ ,  $P=0.03$ ). Among the cardiovascular risk factors, body-mass index, systolic and diastolic blood pressure, and serum concentrations of total cholesterol, triglycerides, low-density lipoprotein cholesterol, and high-density lipoprotein cholesterol, as a group, were strongly associated with the extent of lesions in the aorta and coronary arteries (canonical correlation [a measure of the association between groups of variables]:  $r=0.70$ ;  $P<0.001$ ). In addition, cigarette smoking increased the percentage of the intimal surface involved with fibrous plaques in the aorta (1.22 percent in smokers vs. 0.12 percent in nonsmokers,  $P=0.02$ ) and fatty streaks in the coronary vessels (8.27 percent vs. 2.89 percent,  $P=0.04$ ). The effect of multiple risk factors on the extent of atherosclerosis was quite evident. Subjects with 0, 1, 2, and 3 or 4 risk factors had, respectively, 19.1 percent, 30.3 percent, 37.9 percent, and 35.0 percent of the intimal surface covered with fatty streaks in the aorta ( $P$  for trend=0.01). The comparable figures for the coronary arteries were 1.3 percent, 2.5 percent, 7.9 percent, and 11.0 percent, respectively, for fatty streaks ( $P$  for trend=0.01) and 0.6 percent, 0.7 percent, 2.4 percent, and 7.2 percent for collagenous fibrous plaques ( $P$  for trend=0.003).

**CONCLUSIONS:** These findings indicate that as the number of cardiovascular risk factors increases, so does the severity of asymptomatic coronary and aortic atherosclerosis in young people.

## Coronary atherosclerosis begins at a young age

[HTTP://WWW.THEHEART.ORG/ARTICLE/178963/PRINT.DO](http://www.theheart.org/article/178963/print.do)

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**Cleveland, OH** Coronary atherosclerosis begins at a young age - one in 6 teens already have atherosclerotic plaque in their coronary arteries, according to an in vivo intravascular ultrasound (IVUS) study appearing in the June 5, 2001 issue of *Circulation*.<sup>1</sup>

The finding underscores the need for coronary disease prevention efforts to begin in youngsters, **Dr E Murat Tuzcu** and colleagues (Cleveland Clinic Foundation) write.

Tuzcu et al performed IVUS in the coronary arteries of the donor hearts of 262 heart transplant recipients approximately one month after transplantation. The mean age of the 116 female and 146 male donors was 33.4±13.2 years, and all had been rigorously screened to exclude heart disease before their heart was accepted for transplant. Extensive imaging of all possible coronary segments was performed. Any site with an intimal thickness >0.5 mm was deemed atherosclerotic.

The investigators analyzed a total of 2014 sites within 1477 segments in 574 coronary arteries and found an atherosclerotic lesion in just over half (136 or 51.9%) of the patients. In these subjects, the intimal thickness at the lesion was 1.08±0.48 mm, and percent stenosis averaged 32.7±15.9%.

### **17% of teens already had atherosclerosis**

As expected, the prevalence of atherosclerosis rose with age, with >70% of hearts from donors age 40 and over having one or more atherosclerotic lesions. However, a striking finding was that 17% of hearts from the youngest donors, those aged 12 to 19, also had evidence of atherosclerosis. This percentage jumped to 21% when a less conservative criterion for atherosclerosis intimal thickness >0.3 mm was used, Tuzcu et al report.

While previous necropsy studies have clearly demonstrated that atherosclerosis begins early in life, these studies have had inherent limitations. For example, in studies of Korean and Vietnam War victims, the degree of coronary obstruction was judged by gross inspection and microscopic examination performed without pressure fixation the investigators point out. Their study is unique, Tuzcu et al write, because it provides detailed, clinically relevant, quantitative, in vivo information on early atherosclerosis from an asymptomatic young population.

## **IVUS better than angiography at detecting early disease**

They also point out that the traditional method for in vivo evaluation of the vascular lumen angiography detected relatively few lesions compared to IVUS. Angiograms were abnormal in only 8% of the overall cohort of 262 patients; no angiogram was abnormal in any donor <30 years old, yet 28% were discovered to have had atherosclerosis by IVUS. Because of this, the authors state: angiography is insensitive for early detection and estimation of lesion severity. The greater sensitivity of IVUS is a result of its ability to provide tomographic images of the vessel wall, which permits detection of disease before the onset of luminal narrowing.

Tuzcu and colleagues also note that the incidence of atherosclerosis in youngsters may be even higher than the 17 - 21% found in their study, because they rejected many donors during pretransplantation screening due to clinical or angiographic evidence of coronary artery disease. They conclude their compelling in vivo data, together with previously published necropsy data, emphasize the need to focus societal strategies to limit death and disability from coronary heart disease on the young population.

1 - High prevalence of coronary atherosclerosis in asymptomatic teenagers and young adults : evidence from intravascular ultrasound.2001 Jun 5; 103(22) :2705-10