Morphologic Changes in Coronary Arteries of Children in Different Geographic Locations

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The study of coronary atherosclerosis in children has at least two general objectives. One is to learn more about the natural history of the early development of the disease. Another, in comparing coronaries from geographic areas with differing severity of atherosclerosis in adults, is to learn at what time the disease begins to progress rapidly in the high risk group, and to determine if there are qualitative differences in early lesions from different locations.

In reporting on different studies, immediate problems are encountered because of different methods used to quantitate and describe the lesions, and the differing terminology used. Nevertheless, useful comparisons can be made. In this report we will describe some microscopic features of coronary atherosclerosis in children and young adults from Albany, NY and New Orleans, LA in the U.S.; Uganda in East Africa; Santiago, Chile; Costa Rica; Guatemala; Durban, South Africa; and Bucharest, Romania.

The impetus for the first study to be described (1) was a report by Daoud et al. (2) showing that at autopsy coronary atherosclerosis was much more severe in 16-40 year old males in Albany, New York than in age matched males from Uganda in East Africa (Fig. I). New Yorkers had more, and thicker, atheroma lesions than East Africans. Furthermore, by fifty years, myocardial infarcts are common in New York males, while they are virtually unknown in East Africa at any age.

To follow up on Daoud's findings, we carried out a histologic study of New Yorker and East African coronary arteries from newborn to age 20, and a lipid analysis of coronaries from newborn to age 40. There were 109 New Yorker newborn to 39 years (60 male and 49 females) and 137 East African arteries (95 male and 42 females) available for chemical analysis. In the newborn to 19 year old group, where alternate arterial segments were used for chemical and histologic analysis, there were 35 New Yorkers (24 male and 11 females) and an equal number of age and sex matched East Africans. The tissue for microscopic study was fixed in Carbowax, cut and stained with H & E, oil Red O, and Verhoeef-Van Giesin. Lesions were graded as atheroma if they had necrosis or calcification; non-atheroma lesions were classified as being with and without stainable lipid. The thickness of all lesions was measured with a micrometer. The lipids measured were cholesterol, phospholipid and their esterified fatty acids. Complete details of the methodology are given in the original publication.
Figure I - A comparison of the number of non-atheroma and atheroma lesions in the coronary arteries of New Yorker and East African males 16-40 years. The atheroma lesions (those with necrosis) are obviously greater in number and are thicker in the New Yorkers.

The number and kinds of lesions and their thickness in New York and East African male coronary arteries, newborn to 19 years, is shown in Figure II. There were few atheroma lesions in either group (3 New Yorker and 1 East African), but non-atheroma lesions were found in both groups at all ages; there was no difference in the thickness of the lesions in the two groups. The only striking histologic difference before age 20 in the coronary arteries of the two groups was the increased number of non-atheroma lesions containing lipid in the New Yorker compared to the East African group in the second decade.