e22 Atlas of Atherosclerosis

Peter Libby

We have learned a great deal about the biology of human atherosclerosis in recent years, with new information about the risk factors for atherosclerosis expanding considerably. The application of vascular biology to human atherosclerosis has revealed many new insights into the mechanisms that promote clinical events. The series of animated video presentations presented here illustrates some of the evolving information regarding risk factors for atherosclerosis and the pathophysiology of clinical events.

We have long appreciated the importance of blood pressure as a risk factor for atherosclerosis and cardiovascular events. More recent clinical information has highlighted the importance of pulse pressure, that is, the difference between the systolic pressure and minimum diastolic arterial pressure, as a prognostic indicator of cardiovascular risk. The video clip on pulse pressure explains the pathophysiology of this readily measured clinical variable.

We possess a great deal of knowledge regarding the role of cholesterol in the prediction of atherosclerosis and its complications; however, our knowledge of the mechanism that links hypercholesterolemia to cardiovascular events has lagged the epidemiologic and observational findings. Low-density lipoprotein (LDL) provides an example of a well-understood cardiovascular risk factor. Several of the animations included in this series highlight the role of modified LDL as a trigger for inflammation and other aspects of the pathobiology of arterial plaques that lead to their aggravation and clinical events. We now possess useful tools for modulating LDL. Yet, other aspects of dyslipidemia are on the rise and provide a growing challenge to the practitioner. In particular, low levels of high-density lipoprotein (HDL) and elevated levels of triglycerides characterize the constellation of findings denoted by some as "metabolic syndrome." In the wake of increasing obesity worldwide, these features of the lipoprotein profile require renewed focus. Several of the animations in this collection discuss the concept of the metabolic syndrome and the role of components of the lipid profile other than LDL in atherogenesis.

Our traditional approach to atherosclerosis focused on arterial stenoses as a cause of ischemia and cardiovascular events. We now possess effective revascularization modalities for addressing flow-limiting stenoses, but we recognize that atherosclerotic plaques that do not cause stenoses may nonetheless precipitate clinical events, such as unstable angina or acute myocardial infarction. Thus we must add to our traditional focus on stenosis an enlarged appreciation of the pathobiology of atherosclerosis that underlies many acute coronary syndromes. The animation on the development and complication of the atherosclerotic plaque explains some of these emerging concepts in plaque activation as they apply to the precipitation of thrombotic complications of atherosclerosis.

VIDEO e22-1 (Play video) **Pulse pressure.** Considerable evidence suggests that pulse pressure serves as an important risk factor for future cardiovascular events. This video clip explains the derivation of pulse pressure and some of the pathophysiology that determines this parameter. *(With permission from the Academy for Health Care Education.)*

VIDEO e22-2 (Play video) **Plaque instability.** We currently understand that most coronary thromboses result from a physical disruption of the atherosclerotic plaque. This video animation explains some of the current concepts of the pathophysiology of atherosclerotic plaque disruption and how it triggers arterial thrombosis.

VIDEO e22-3 (Play video) **Lipoprotein menagerie.** The lipid profile confers important information regarding cardiovascular risk and the effects of therapies; understanding lipoprotein metabolism provides insight into the pathophysiology of arterial disease. This video animation presents the rudiments of the metabolism of lipoproteins important in clinical medicine.

VIDEO e22-4 (Play video) **Formation and complication of atherosclerotic plaques.** We now understand the generation of atherosclerotic plaques as a dynamic process involving an interchange between cells of the artery wall, inflammatory cells recruited from blood, and risk factors such as lipoproteins. This video animation reviews current thinking about how risk factors alter the biology of the artery wall and can incite initiation and progression of atherosclerosis. This presentation also discusses the importance of inflammation in these processes, and portrays the role of inflammation in plaque disruption and thrombosis. Finally, this animation depicts the concept of stabilization of atherosclerotic plaques by intervention such as lipid lowering.

VIDEO e22-5 (Play video) **Atherogenesis.** This video clip highlights some of the current thinking about mechanisms of atherogenesis.

VIDEO e22-6 (Play video) **Metabolic syndrome.** A number of important cardiovascular risk factors tend to cluster in a pattern described by some as the "metabolic syndrome." While controversy persists regarding whether cardiovascular risk due to these factors is additive or synergistic, their clinical importance is growing. This animation discusses some of the metabolic derangements that underlie the "metabolic syndrome."

(From Peter Libby, MD: Changes and Challenges in Cardiovascular Protection, A Special CME Activity for Physicians. Created under an unrestricted educational grant from Merck & Co., Inc. Copyright © 2002, Cardinal Health; used with permission.)