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## Aging and Diseases of the Heart

Shlomo Stern, MD; Solomon Behar, MD; Shmuel Gottlieb, MD



**T**he different systems that serve our body and mind undergo alterations during the aging process as an unavoidable part of life. This process starts, according to some researchers, with birth and accelerates with advancing age, leading to changes that are sometimes obvious but frequently go unnoticed for a long time. One of the most widely discussed, investigated, diagnosed, and treated processes is atherosclerosis, which leads to unmistakable damage to our cardiovascular system.

It is not in the scope of this article to delve into the question of whether this process is a natural part of aging or should be considered a disease. Whichever the case, with the aging of our population, we must deal more and more frequently with symptoms and signs of atherosclerosis and with the disease it causes, the ways we can avoid it or at least to slow the process, or, if detected at a late stage, how to treat it.

### Processes That Accompany Aging

With age, the function of the heart is influenced mainly by the decrease in elasticity and the ability to respond to changes in pressure (compliance) of the arterial system. The resultant increase in the resistance to the pumping action of the heart thereby increases

the work needed to drive the blood to the various organs of the body.

The atherosclerotic process results in thickening of the arterial wall, and this is relatively easily measured in our neck (carotid) arteries by the Doppler method, which involves a sonar or ultrasound image of the artery. The presence of such thickening may itself be a sign of preclinical disease and may even predict future cardiovascular disorders. The ensuing stiffening of the arteries leads to high blood pressure and, in the elderly especially, the upper (systolic) pressure increases, the lower (diastolic) pressure decreases, and the difference between the two, the pulse pressure, increases. This last effect is an independent risk factor for developing cardiovascular disorders. It is difficult to treat this type of hypertension, and only recently have there been indications that certain types of therapy that target the thickening of the arterial wall rather than aiming at lowering the pressure itself can be helpful. Among the drugs used to remodel the arterial wall, we find some old remedies, as well as newly discovered agents.

The aforementioned increased load on the heart leads to an increase in the mass of the heart (hypertrophy) and to the formation of scar tissue in the heart muscle, thereby leading to impairment of the vital relaxation of the heartbeat. If the scarring affects the tiny organ

(sinus node) that guards the regularity of the heart and/or the other minuscule node (the atrioventricular or AV node) that is essential for the propagation of the electrical impulse to the ventricles, major and sometimes fatal disturbances in heart rate and rhythm may occur.

Formation of calcium crystals (calcification), which may be looked on as an extreme degree of fibrosis, affects mainly the heart valves, especially the aortic valve, which is located between the left ventricle and the aorta. This situation, which frequently can begin in people in their fifties, is often described, somewhat pejoratively, as senile aortic stenosis. Other cardiac valves may be involved as well, but the frequency of their involvement is far less. If calcification is detected in the coronary arteries, this may be a sign of atherosclerosis even in asymptomatic individuals.

### Symptoms That Should Lead to a Medical Consultation

Elderly patients (those over the age of 70) should not neglect symptoms, such as shortness of breath, progressive fatigue, heartbeats that are too fast, too slow, or irregular, pain or discomfort in the left chest, or dizziness because all of these symptoms may not be a consequence of age alone but could

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signify a recently acquired heart condition.

### Angina Pectoris

Pain in the left chest or more commonly "chest tightness" (angina pectoris), especially if elicited by physical or emotional stress, is a very frequent symptom in the elderly and becomes more frequent with advancing age. Paradoxically, angina pectoris without pain, also known as silent ischemia, becomes more frequent in older age (for more detailed information, see the Clinician Update by Stern. Angina pectoris without chest pain: clinical implications of silent ischemia. *Circulation*. 2001;106:1906–1908). Thus far, no explanation for this has been provided, but the phenomenon of silent or atypical presentation of chronic ischemic heart disease makes the diagnosis in the elderly more difficult. The two most frequently used diagnostic tools, the resting electrocardiogram [ECG] and exercise testing, also have limitations in the elderly, and therefore nuclear and echo testing with pharmacological agents are especially justified in this age group. The ultimate diagnostic test for angina pectoris is coronary arteriography, recommended frequently for octogenarians and occasionally even for nonagenarians (for more information on coronary arteriography, see the Cardiology Patient Page by Lange and Hillis. Diagnostic cardiac catheterization. *Circulation*. 2003; 107:e111–e113).

Even in old age, revascularization therapies for angina pectoris, such as angioplasty or bypass surgery, seem to be superior to treatment with medicines with regard to improving quality of life and reducing angina severity without increasing cardiac mortality risk.

### Acute Coronary Syndromes

Heart attack or acute symptoms that warn one of an impending heart attack are called acute coronary syndromes (ACS), and they become more frequent with advancing age. Even with a decrease in mortality from this disease over recent years, 85% of those who die from coronary heart disease are

more than 65 years of age. Peculiarly, the characteristic expressions of ACS seen in younger persons (for example, angina pectoris at rest) are less typical and may even become nonexistent in the elderly. Moreover, the ECG, a relatively simple diagnostic tool that is the most widely used and which in younger persons shows typical alterations often yields fewer clues in elderly individuals. Thus, in the elderly, ACS may go unnoticed, unless the patient and the physician are aware of sudden shortness of breath, sudden fatigue, discomfort that may be confined to the abdomen more than to the chest, profound sweating, irregular heart beat, or even fainting (syncope); all of these symptoms alone or in combination may herald the development of ACS. With such alertness, the high rate of unrecognized heart attacks in the elderly may be significantly reduced.

When a heart attack or ACS is diagnosed, drug therapies and/or immediate or early cardiac catheterization, ie, placing a catheter into the arteries that supply the heart muscle, injecting dye to visualize sites where the arteries are narrowed or occluded, and opening an occluded artery by balloon technique (angioplasty), have been shown to be as useful in the elderly, both in men and women, as they are in younger people.

### Heart Failure

Fatigue, shortness of breath, and swollen legs are the most common symptoms when the heart fails to perform its normal pumping function. The incidence of heart failure increases with age as the heart becomes more vulnerable to various injuries or simply begins to deteriorate as a pump as part of the aging process. The underlying causes of heart failure include impaired pumping function of the heart (contractility) caused by damage to the heart from decreased blood supply or a prior heart attack (systolic dysfunction), or an increase in pressure load or impaired relaxation (diastolic dysfunction, the ability of the heart to relax

and fill passively with blood). In fact, with advancing age, the proportion of people with heart failure but normal systolic function approaches 50% or more. Diastolic dysfunction occurs more often in women than in men and also more often with hypertensive heart disease and diabetes. Even if well treated, heart failure leads more frequently to death in the elderly than in younger individuals.

### Irregular, Too Slow, or Too Fast Heartbeats

Alterations in the heartbeat are not necessarily perceived in the chest, but frequently patients experience them over the neck arteries, or may become aware of their presence because of sudden sweating, pallor, weakness, occasional dizziness, and/or fainting. Sometimes such disturbances may be present without any symptoms. The most frequent but usually not too serious arrhythmia is atrial fibrillation, which becomes more prevalent with advancing age. More serious arrhythmias are the ventricular arrhythmias that have marked predictive significance and are associated with increased mortality, especially if they occur after a heart attack. Twenty-four-hour ambulatory ECG recording (Holter monitoring) is invaluable in detecting hidden arrhythmias even in asymptomatic patients, and it has been shown that the frequency and complexity of such arrhythmias increase with age and after a heart attack.

Slow heartbeat, most commonly induced by a block in the electrical conduction system of the heart, is effectively treated by the implantation of a pacemaker, a procedure that is used without any age limit. The more sophisticated implantable heart device, the defibrillator, is also used frequently in the elderly with considerable benefit (for more information on defibrillators, see the Cardiology Patient Page by Reiffel and Dizon. The implantable cardioverter-defibrillator: patient perspective. *Circulation*. 2002;105:1022–1024).

Recently developed drug therapies for the management of arrhythmias should be used in the elderly as well, but possible other illnesses in the aged (co-morbidities) that may affect the absorption, metabolism, and the excretion of the drug must be taken into consideration.

### Preventive Measures in Old Age

Advice given to a young person aimed at prevention of atherosclerotic heart disease or its progression is valid for the elderly as well. Although aging itself is an independent risk factor for cardiovascular disease, we still advocate—irrespective of age—avoidance of smoking, promotion of physical activity, control of blood pressure, careful hypoglycemic therapy in diabetics, prevention of obesity, and all other measures that promote cardiac health. Surprisingly, statin therapy to reduce cholesterol has been shown to reduce mortality even if started over the age of 80 years, and in these individuals, lipid levels similar to those in younger persons are targeted.

### AGING AND DISEASES OF THE HEART: SUMMARY

#### Alterations induced by advancing age:

- Alterations in the arteries
  - Decreased elasticity
  - Decrease in compliance
  - Atherosclerosis
- Alterations in the heart
  - Fibrosis
  - Increase in mass
  - Calcification

#### Consequences of age-induced alterations:

- Increased blood pressure
- Angina pectoris
- Heart attack
- Heart failure

#### Frequent symptoms in old age:

- Shortness of breath
- Fatigue
- Palpitations
- Chest pain or discomfort
- Dizziness

#### In old age:

- Typical angina is less frequent
- Heart attack may be silent
- ECGs are less representative

### *continued*

#### Measures of prevention:

- No smoking
- Physical activity
- Control of blood pressure
- Control of diabetes
- Maintain healthy weight
- Statins to reduce cholesterol

### Additional Information

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