SPECIAL ARTICLE

Psychological Factors and Heart Disease

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At present, most research findings have encouraged us to think of heart disease as a purely physical problem with emphasis on hereditary and dietary variables as basic problems. Despite this emphasis, a number of reported observations point up the relationships between psychological factors and heart disease.

The conclusions suggested by these studies indicate that heart disease may, in part, be due to or aggravated by psychological variables. The following reports further suggest that psychological factors should be included among the factors to be investigated in longitudinal studies of the development of cardiovascular disease.

The relationship between the cardiovascular system and psychological factors has been usually studied in three ways. In many experiments individuals have been subjected to stress situations or stimuli designed to disturb them, and their cardiovascular responses have been recorded. Another approach includes clinical studies in which cardiac patients are interviewed to determine what stresses have preceded their illness. In a third group of investigations, the personality characteristics of cardiac patients have been examined. The findings of the research in these areas will be the focus of this paper.

Stress Stimuli and Cardiovascular Responses

A number of studies have shown a relationship between psychological factors and cardiovascular responses. Cannon and Mendenthal\(^1\) found that during rage the clotting time of blood was markedly shorter. In 1929, Grollman\(^2\) studied the cardiac output, pulse rate, and blood pressure of four healthy medical students before and after they were accused of laxity in their school work. He found that when the students responded with resentment, regret, or anger, they showed an increase in pulse rate, blood pressure, and cardiac output.

In 1945, Stead and his associates\(^3\) studied blood donors who were tense and those who were relaxed about having their blood removed. He found that tensions caused a higher heart rate, oxygen consumption, and cardiac output, but lower peripheral resistance.

In 1946, Wolf and Wolff\(^4\) found that healthy subjects without complaints or evidence of cardiovascular disease, under stressful conditions that cause anxiety and resentment, show impaired exercise tolerance as judged by excessive increases in heart rate, stroke volume, or both, during exercise.

Pfeiffer and Wolff\(^5\) studied 35 subjects before and after emotional conflict was induced by "discussion of topics of important personal significance." These investigators found that elevation in blood pressure was induced by these discussions. Blood clotting time and blood pressure were studied by Schneider\(^6\) in 26 subjects before, during, and after they completed a "stressful interview." He found that when subjects showed a significant elevation in blood pressure during the interview, they also showed a shorter clotting time.

Stevenson and Duncan\(^7\) studied closely 70 clinic patients with a variety of cardiovascular complaints. The investigators found that life stress evoking anxiety and resentment was met by cardiovascular mobilization,
characterized by increase in heart rate and in cardiac output and elevation of blood pressure. Rapid alterations in the electrocardiogram, including changes in the amplitude and direction of the T wave, occurred in association with changes in state of feeling. Disturbances in cardiac rhythm also occurred in relation to anxiety, depression, and resentment brought on by life stress.

Macht\textsuperscript{5} found that blood clotting time was 8 to 12 minutes in blood donors at a blood bank who were calm, 4 to 5 minutes in apprehensive donors, and 1 to 3 minutes in highly nervous donors.

Hickam and associates\textsuperscript{8} studied blood pressure, heart rate, and peripheral resistance in 23 medical students, before and after academic oral examinations, and in 12 hospital patients who were told that intracardiac catheterization was necessary for them but involved some risk. The cardiac output, heart rate, oxygen consumption, and blood pressure were increased. In certain subjects, anxiety was attended by circulatory collapse. In such cases, the peripheral resistance was decreased, but the compensatory increase in cardiac output did not occur, with a resultant fall of blood pressure to low levels. In a small group of subjects, anxiety resulted in an increase in peripheral resistance and an elevation of blood pressure, with no increase in cardiac output.

Hellerstein and his team\textsuperscript{10} found that the work of the heart in surgeons was higher when they performed surgery, and lower when having exercise. A surgeon working at an energy expenditure rate approximately one third less than a steel worker may have an increase in heart work four or five times greater. They concluded that the changes in the body which condition health or disease are determined as much by what the job means to the worker as by how much energy it requires.\textsuperscript{11}

Considerable attention recently has been focused on the relationship between cholesterol and heart disease. Several workers have found a significant increase in the mean value for serum cholesterol of students during examination periods.\textsuperscript{12-15} Friedman and Rosenman\textsuperscript{16} similarly found that, in accountants, the socioeconomic stress imposed by job deadlines in tax periods was associated with a rise in serum cholesterol and acceleration of blood coagulation time.

While the exact significance of these findings is not yet clear, elevations of cholesterol level may contribute to the early onset of coronary artery disease in some individuals. These studies strongly suggest that any study of heart disease predicted on serum cholesterol differences should take the psychological factors into consideration.

The above studies indicate that criticism and testing of work and job deadlines may be perceived by many individuals as stressful. Not all individuals, however, respond to a given situation in a similar manner.\textsuperscript{17} Some individuals may perceive their work routine, loud noises, odors, speed of work performance, vibrating machinery, or interruptions as stressful. Personal factors such as reaction to supervisors, other employees, and management, are capable of producing emotional stress with secondary demands on the heart.

**Stress Preceding Heart Disease**

Cardiologists have long recognized that emotional factors appear to have played an important role in patients whose coronary circulation is already impaired. Many workers have reported emotional strain or acute excitement to precede acute myocardial infarction or congestive failure in a significant proportion of cases.\textsuperscript{18-21, 22-31}

Russek and Zohman, in a study of 100 coronary patients under the age of 40 and 100 normal controls, found that "emotional stress of occupational origin appeared far more significant in the etiological picture of coronary disease than did a positive heredity, a prodigiously high fat diet, obesity, body build, tobacco consumption or exercise.\textsuperscript{7,32}

**The Coronary Personality**

The psychological aspects of heart disease have been studied by a number of investigators who attempted to determine the personal characteristics of cardiac patients.
Dunbar, in a psychiatric study of 22 patients, described a typical "coronary personality" profile as consisting of "compulsive striving, hard work, self discipline and great need to get to the top." Arlow reported psychiatric observations on 13 cases, and stressed the patient's childhood problems of identification with authority and, in addition, stated that "this minor insecurity and sense of weakness which the patient fears to face and which he seeks to deny, remain unaffected by realistic achievements." Both Dunbar and Arlow concluded that the character structure of the patient predisposes him to coronary occlusion.

Kemple, in using the Rorschach method on patients hospitalized for coronary occlusion, stated "they manifest a persistent pattern of aggressiveness and drive which distinguishes them from patients in other groups. They are usually very ambitious and strive compulsively to achieve goals incorporating power and prestige."

Gildea, Dunbar, and Halliday, came to similar conclusions on behavior patterns and personality factors in patients with coronary artery disease. Miles et al., and Weiss et al., did not find a significant different "coronary personality." Friedman and Rosenman found an increased incidence of evidence of coronary artery diseases in subjects classified as oriented toward competitive activities with deadlines, as compared with anxious but noncompetitive people or with more passive subjects.

Summary
A number of studies have revealed that perceived emotional stress can produce various transient cardiovascular responses. The reactions may include changes in heart rate and cardiac output. They may include abnormalities in heart rhythm, changes in blood pressure, peripheral resistance, blood viscosity, blood clotting time, and serum cholesterol levels. A hypothesis suggested by the findings which requires further research follows: If these cardiovascular responses were sustained for a period of time, they would ultimately influence the onset or course of coronary artery disease. These studies also suggest that emotional tension at one's work may place an additional strain on an already diseased heart.

In patients whose cardiovascular system is already impaired, investigators have traced the sequence from emotional upset to heart disease. Since the reported evidence has been based on cardiac subjects, it is still possible that "gradual increase in tension" is perceived only after illness occurs, but not necessarily perceived as stressful before heart disease. Owing to the lack of prospective studies in which the life stress factors are studied prior to heart disease, emotion as a cause or contributory factor to heart disease has not been fully accepted.

These studies suggest that certain personality traits may be common to certain forms of heart disease. Most of this evidence has been observed from time-consuming, detailed personality analysis, and the evidence depends on studies of relatively few patients and poor or no controls.

It is important to note that these studies on personality type and heart disease were conducted after heart disorders developed. This raises the question of whether the reported personality characteristics preceded or followed the heart disease. The investigations to date assume that the personality structure occurred before the appearance of the heart disease, but before we can answer this question, a longitudinal study of the personality of individuals prior to cardiovascular disease would be necessary.

Conclusion
The findings of a number of investigations and observations in the study of psychological aspects of heart disease suggest the following relationships between psychological factors and heart disease:

1. Circulatory responses are produced by individually perceived stress which may influence the occurrence or course of heart disease.

2. Cardiac patients often report a history
of gradual increase of life stress situations prior to heart disease.

3. Individuals with cardiovascular disease often present a history of working excessively under self-imposed and environmental pressure.

Sufficient evidence has accumulated to indicate that the psychological aspects of heart disease should be among the factors to be investigated in prospective studies of factors related to the development of heart disease.

References


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Science and Humility
The truly scientific spirit, then, should make us modest and kindly. We really know very little, and we are all fallible when facing the immense difficulties presented by investigation of natural phenomena.—CLAUDE BERNARD, M.D. An Introduction to the Study of Experimental Medicine. New York, The Macmillan Company, 1927, p. 39.
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