

The Heart
And The Risk For
Coronary Heart Disease

Cardiovascular Disease

Cardiovascular diseases have been the leading cause of death in most industrialized countries. Amongst the different forms of cardiovascular diseases, by far the most prevalent is coronary artery disease, also referred to as ischemic heart disease which is a result of hardening of the coronary arteries. In Canada it is the number one health problem. It kills eighty thousand Canadians each year, afflicting one in four of our adult population. Forty percent of the men who die of heart disease are between the ages of thirty-five and fifty-two. In the female population the incidence is growing rapidly.

The heart is a powerful muscular pump which sends blood to the different organs of the body. To sustain itself, it needs oxygen and nutrition. This is supplied by the left and right coronary arteries.

The heart is one of nature's most efficient and durable pumps. Each day it beats more than one hundred thousand times and each day it pumps nearly two thousand gallons of blood. The heart works day and night, every day of ones life, and it rests only in between beats for a split second. But, as with all machines, things can go wrong. Any part of the pump can become defective. The most common problem involves the coronary arteries.

In healthy individuals the oxygen and the nutrients supplied through the coronary arteries maintain a good balance with the demand put forth by the heart muscle.

When the demand increases under circumstances such as physical exertion, during eating, an emotional crisis or exposure to cold and at this time if the oxygen supply through the coronary artery is not adequate because of hardening of the arteries (atherosclerosis), it is in such circumstances that the heart muscle cries out in pain and this is called angina.

Therefore, angina is a temporary lack of oxygenated blood to the heart and usually lasts less than five minutes and is brought about by exertion, eating, emotion or exposure to cold or it may also occur for no apparent reason at rest. Angina can be controlled either by getting rid of the trigger factors or by using a nitroglycerine tablet under the tongue.

When the blood supply to an area of the heart is completely cut off through blockage of the coronary artery, that area of the heart muscle dies. At this stage, the patient may experience a moderate to severe sensation of queasiness, tightness, or crushing pain usually beginning at the center of the chest. The pain may travel to or even begin in the shoulder, arm, neck, jaw or back. There may be associated sudden sweating, shortness of breath, nausea and or vomiting with extreme fatigue and marked anxiety. Some, all, or none of these symptoms can occur during a heart attack and the symptoms can be different for different heart attacks in the same person. Some patients may get a heart attack even without knowing it and this is called silent myocardial infarction.

An Ischemic Heart is a result of a slowly developing disease of the coronary artery called atherosclerosis. The disease may begin in childhood and is

believed to be a slow build-up of fatty substances, such as cholesterol, on the walls of the arteries of the heart. These deposits continue to thicken the arteries in some places. The Lumen become narrowed allowing less oxygen rich blood to pass through. If the fatty deposits continue to grow, significant obstruction of the artery prevents the flow of oxygen rich blood. The diseased artery may be blocked by a blood clot resulting in a coronary thrombosis, causing a heart attack.

As opposed to angina, a heart attack is due to prolonged lack of oxygenated blood to the heart which usually lasts more than five minutes and is not relieved by rest or nitroglycerine and will require immediate medical attention.

The presence of mild or even moderate narrowing of coronary arteries is generally not associated with any symptoms. But as the narrowing becomes severe the patient starts manifesting symptoms of coronary heart disease. Some people may present symptoms with their first heart attack others may develop angina and in a small percentage of cases sudden death may be the initial and only manifestation of coronary heart disease and it can occur without any prior warning.

Therefore, angina is a warning sign and its presence informs us that the heart muscle is still alive and not irreversibly damaged. In adults a nuance of chest pain should never be ignored because ignoring or denying this important symptom may lead to permanent damage to the heart muscle and could place ones health and even life in jeopardy. For patients who already have angina they should notify their doctor if the angina changes its status i.e.; the pain or discomfort has become more severe than usual and lasts for a longer period of time or is occurring at more frequent intervals with lesser amount of activity and not being held with the usual dose of nitroglycerin.

After a heart attack the body sets out to repair the damaged muscle. The healing process, during which scar tissue replaces the infarcted heart muscle, requires about six to eight weeks. The recovery period allows the patient to regain the strength and stamina and it takes about two to three months before the patient can get back to “normal”.

The Heart; A Magnificent Pump

The Heart is a muscular hollow organ which lies in the middle of the chest slightly to the left protected by the breast bone and the ribs. It is made of muscle tissue called “myocardium” or heart muscle and is divided into a left and right side by a solid wall of muscle termed the septum. On either side of the septum there are two chambers, an upper chamber called the atrium and a lower chamber called the ventricle. The right atrium receives oxygen poor blood from the rest of the body and empties into the right ventricle which in turn pumps blood into the lungs to pick up oxygen and get rid of carbon dioxide and the lung in turn empties its blood into the left atrium. The left atrium evacuates its contents into the left ventricle which is the main pumping chamber of the heart and this sends blood under high pressure through the aorta to other parts of the body. To regulate this flow of blood through the different chambers of the heart there are four

valves. The left side of the heart has the mitral valve between the left atrium and the left ventricle and the aortic valve between the left ventricle and the aorta. In the right side there are also two valves the tricuspid valve between right atrium and right ventricle and the pulmonary valve between the right ventricle and the pulmonary artery.

As the heart beats the blood is pumped through a system of blood vessels or elastic-like tubes that carries blood to every part of the body. The blood leaves the heart through arteries and returns to it in veins. The body's main artery is the aorta which is about an inch wide and this divides into several large arteries conducting blood to the different parts of the body. It is like the branches of a tree which divide into smaller and smaller branches and finally to twigs. The smallest arteries join up with these twigs called the capillaries which deliver oxygen and nutrients at the cellular level and they pick up carbon dioxide and waste product from the cells and drain into their smallest veins. The veins then join up together with the larger ones and return blood to the heart. This vast network of blood vessels including arteries, capillaries and veins is over sixty thousand miles long which is more than twice the distance around the world.

The pumping activity of the heart is under control of an electrical system which is necessary for rhythmic contraction of the different chambers. When the upper chambers of the left and right atrium contract the left and right ventricles relax. When the blood is pumped out of the left and the right ventricle into the aorta and the pulmonary artery, at this time the left and right atrium are relaxing. All this is under the control of a natural pacemaker which sets the pace for the heart beat.

The Coronary Arteries

In order to accomplish its task the heart muscle needs oxygen and nutrients. Although blood flows through its chambers the heart cannot feed itself directly from inside the chambers. The blood vessels that supply oxygen rich blood are called coronary arteries. They get their name from the Latin word "corona" which means crown because these arteries encircle the heart like a crown. The two coronary arteries, the left and the right, arise from the aorta just beyond the point it leaves the heart. The left coronary artery has a diameter of a drinking straw and is less than an inch long and it conducts over two thirds of the oxygen rich blood feeding the heart muscle. This left main artery divides into an anterior branch which travels down the front of the heart and therefore is called the left anterior descending artery. The other branch circles around the left side and therefore is called the left circumflex artery. The right coronary goes down the right side and then to the back of the heart. Therefore, we talk about coronary arteries in terms of three blood vessels, the two left and one right.

Symptoms Of Heart Disease

The symptoms of heart disease are chest pain which is due to inadequate blood flow i.e.: oxygen to the heart muscle; shortness of breath which is due to weakness of the heart pump; palpitation and dizziness which is due to disturbance of the hearts' rhythm. The chest pain could be angina or a heart attack.

Chest pain also occurs due to problems with the chest wall, the lungs and the esophagus. Shortness of breath or dyspnea is an uncomfortable awareness of breathing and this occurs when the heart pump starts failing and the heart is unable to pump blood at the same rate that the blood is returning to it from the rest of the body. Shortness of breath can occur during exercise, at rest and lying flat. Breathing difficulty can occur also due to lung causes, anxiety, being overweight and in poor level of physical fitness. Palpitation is an unpleasant awareness of the heart beating and this can occur due to a slow heart rate, a fast heart rate or when the heart is skipping a beat and it feels like a flip flop sensation., When the heart beats too slow or too fast, this can reduce the blood supply to the brain and it may result in a feeling of "faintness". This is called syncope or near-syncope. Syncope and light headiness can also occur as part of a "common faint" in normal hearts i.e.: when an individual is in a crowded hot room or when there is an unpleasant stimulus such as fear.

Risk Factors Of Heart Disease

Risk factors are those conditions and habits associated with an increased risk or likelihood of an individual developing coronary heart disease. When an individual has two or more risk factors the chances of suffering a heart attack or experiencing angina is multiplied.

The knowledge of risk factors helps identify the individual as well as some groups of persons probability for developing heart disease. Some of these risks can be modified so the chances of a heart attack can be reduced.

The risk factors which cannot be controlled are age, sex and heredity or family history. The major controllable risk factors are cigarette smoking, high blood pressure and high cholesterol. There are yet other risk factors which can be modified but whether these influence heart attacks is not proven. These are sedentary life styles, obesity, diabetes and stress.

Age

The risk of CHD goes up sharply with age in all populations. For men, the rate of increase is linear. For women, the rate of increase is relatively slow before the age of menopause and accelerates more rapidly thereafter. The increase of CHD mortality by age differs between nations, with the more highly industrialized nations exceeding most developing nations, with the more highly industrialized nations exceeding most developing nations. This suggest that the mechanisms involved are importantly associated with life-style and are not strictly determined by biological aging.

Sex

Men have much higher rate of CHD incidence and mortality than women throughout the life cycle. Death rates for CHD are twice as high for men than they are for women. The differential seems not to be due to estrogen levels primarily or to other inherent biological differences, rather, the male excesses in average intensity of Type A behavior pattern. Work overload, and cigarette smoking probably explain a substantial part of this difference as well.

Socioeconomic Status

Prior to World War II persons of high socioeconomic status had higher CHD risk than did persons with less education and low prestige occupations. By the 1950's, the social status differentials had largely vanished, only to reemerge in more recent years in the reverse direction. Persons of lower socioeconomic status now have higher CHD incidence and mortality than do persons in the middle and upper classes. This reversal of the gradient of CHD risk associated with socioeconomic status is related to similar reversals in risk factor gradients. Cigarette smoking is now more prevalent in persons of lower educational and occupational levels. Obesity is also far more common among the less affluent. High blood pressure and hypertensive disease have been observed to be substantially more prevalent in persons with lower income and lower levels of education.

Elevated Blood Pressure

Levels of systolic and diastolic blood pressure have a linear relation with risk of CHD and total cardiovascular disease morbidity and mortality. For ninety to ninety-five percent of hypertensive the cause of the problem is not known, although obesity, high salt intake, excessive use of alcohol, and psychosocial factors appear to be involved in many cases. For persons with moderate to severe levels of hypertension, pharmacologic treatment is usually necessary. Simultaneous use of the behavioral interventions described here can, in many cases, reduce the drug dosage required for adequate blood pressure control and, in mild cases of hypertension, may supersede the need for the drugs.

For even mildly overweight people, weight loss generally reduces blood pressure. Reduction in sodium intake is often dramatically effective in persons sensitive to this ion. A program of aerobic exercise can be helpful as well as relaxation, yogic exercise and meditation.

Cigarette Smoking

Cigarette smoking is a major risk factor for CHD. Twenty or more cigarettes per day can double or triple the risk of myocardial infarction. It has been noted that all age groups regardless of sex continue to reduce their rates of cigarette smoking, except young White women. Smoking cessation has occurred more frequently in persons with higher than with lower education. Smoking cessation is reflected in reduced CHD risk, and some studies have suggested that a measurable decline in CHD risk occurs in one to five years. The frequency of cigarette smoking has been declining in middle-aged persons, particularly among men, but has shown disturbing increases in the 15 to 24 year old age group, particularly among women.

Dietary Habits, Obesity And Blood Cholesterol

Eating-habits provide another major behavioral contribution to cardiovascular health or disease. Excess calories, saturated fat and cholesterol will be dis-

cussed in connection with obesity and blood lipids.

Obesity: It is paradoxical indeed that for most Americans and most Europeans, the most wide spread life-threatening nutritional problem is not hunger but obesity. According to the Pan American Health Organization, citizens of the United States eat 815 billion calories of food every day. This is roughly 200 billion calories more than they need to maintain a moderate level of activity. These extra calories are enough to feed a country of eighty million people adequately. Fourteen percent of men and twenty-four percent of women aged 20-74 are obese.

Obesity is far more common in persons with less education and lower income than among those of higher socioeconomic status. Cultural patterns and habits of personal choice are even stronger contributors to obesity.

Obesity is a major risk factor for total mortality as well as for CHD by elevating blood pressure and the bad cholesterol (low-density lipoprotein). Obesity may also contribute independently to risk, particularly for persons less than forty years old. Obesity is also a major risk factor for the development of hypertension and adult-onset diabetes, the latter being not as common but still a potent risk factor for CHD.

Cholesterol: Total serum cholesterol has been identified as a major risk factor for CHD. High levels of low density lipoprotein (LDL) raise CHD risk. High levels of high density lipoprotein (HDL) lower CHD risk.

The relative proportions of HDL and LDL in serum total cholesterol are influenced by diet, exercise and alcohol use. Diets high in saturated fats and cholesterol tend to raise levels of LDL. A regular program of aerobic exercise over time will tend to convert other fractions of cholesterol into HDL. Small amounts of alcohol consumption (not more than one or two drinks a day) have also been reported in some studies to increase HDL relative to LDL.

Behavioral factors also correlate with levels of serum cholesterol. Increases in serum cholesterol of ten to twenty percent and occasionally higher has been found in accountants approaching tax deadline, medical students approaching examinations and other groups facing stresses that create activation rather than fear.

Alcohol

Light and moderate drinkers have tended to show a modest reduction in CHD risk. The reduced CHD incidence associated with light drinking occurs despite the well-established effect that moderate-to-heavy alcohol consumption has on elevating blood pressure levels.

Chronically high levels of alcohol consumption promote a deterioration of the cardiac muscle which predisposes to sudden coronary death. Acute episodes of heavy drinking irritate the myocardium to result in electrical conduction disturbances, which also raise the risk of sudden cardiac death.

Exercise

Physical inactive life styles have long been recognized to lead to a reduction of cardiorespiratory endurance and muscular strength as well as an increase of body fat.

Moderately strenuous aerobic exercise regularly performed may be associated not only with a reduction in the incidence of CHD but also with lowered provability that any given CHD attack will be fatal.

People who routinely are involved in moderately intense activities such as jogging, bicycling, swimming and stair climbing have been found to have lower CHD risk.

Physically active people tend to accumulate less body fat, which in turn has a favorable influence on blood pressure and blood lipids. By increasing cardiorespiratory efficiency, regular exercise also tends to reduce blood pressure during the remainder of normal daily activities. Exercise has been associated with higher levels of HDL cholesterol and lower levels of LDL and VLDL lipid fractions. People who exercise regularly are also less likely to be regular smokers. Some of the apparent benefits of exercise in lowering CHD risk may, in fact, be secondary to less cigarette smoking, lower blood pressures, and more favorable blood lipid composition.

Widespread interest in physical fitness and recreational exercise seems to be primarily centered on young and intermediate-aged adults in the middle and upper socioeconomic strata. Not many laborers take up jogging after their 8-hour shift, even though most manual jobs have been sufficiently automated so they demand only a minimum of sustained aerobic activity.

Stress

Psychosocial and Behavioral Risk Factors: The past 25 years have witnessed an active search for CHD risk factors. Many of these newly identified risk indicators are psychosocial and behavioral in their manifestations. The pathogenic mechanisms by which they might exert their influence on the cardiovascular system are less clearly identified than those for the more traditional biological risk factors.

Type "A" Pattern: The Type A or coronary-prone behavior pattern is neither a personality trait nor a set of external events but rather is the behavior that emerges when a characteristically predisposed person is challenged by an environmental circumstance. Type A is characterized by some or all of the following traits: competitiveness, intensive striving for achievement easily provoked hostility, a sense of urgency, quick actions, punctuality, impatience abrupt and rapid speech, emphatic gestures, and concentration on self-selected goals to the exclusion of other aspects of the environment including the words and intents of others. These personalities are also overcommitted to vocational or professional achievement at the expense of other facets of life. People who have the opposite style of behavior, who are relaxed, unhurried, less easily provoked to anger, who speak and gesture with smoother modulation, and who are more open to the

broad richness of life experience, are defined as Type "B" personalities.

Type A behavior is clearly not the same as stress or distress because Type A is neither an unpleasant stimulus nor a reaction of discomfort. Rather, it is a pattern of intense and sustained behavioral activation that is usually self-initiated.

Work Overload: Work overload is another component of the general cluster of variables reflecting intense behavioral activation. It differs from the Type A behavior pattern in that it is not so dependent on an individual's personality predisposition. Occupational stress such as overtime work, the repetitive stress of assembly line labor, and jobs involving steady exposure to conflicting psychological demands have also been identified as being risk factors of CHD.

Chronic Troubling Emotions: This category includes such variables as anxiety, neuroticism, depression, hypochondriasis (somaticizing), life dissatisfaction, and interpersonal discord. All these variables have repeatedly been found to be associated with the presence of one or more form of CHD, particularly angina pectoris. These variables have been shown to result in a two-fold increase in CHD risk. Emotional drain or physical exhaustion may be a risk or an early prodromal symptom of CHD.

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