I know a lot of guys at work who have had heart surgery. It has become, like they say, a kind of status symbol around the office to brag about the number of bypass grafts some doctor or other has plugged into your heart. Me, I've had chest pains for only a couple of months now, but they're getting worse all the time, and the medicine my doctor has given me isn't making much difference anymore. I saw him the other day, and he said it's about time to operate.

It's really terrific, when you think what modern medical doctors are doing these days. I hear they can stop your heart for hours, keep your blood circulating through a machine, and, when they're ready, bring you back to life. So in my case I don't see much reason for delaying things. However, I've read a few newspaper articles that say bypass surgery is being overused. Maybe getting a second opinion would be smart. I trust my doctor, but still, if there is any safe alternative to getting my chest cracked open, I'm all for finding it. Frankly, I'm scared.
HEART DISEASE

My other doctor is always so vague with his answers to my questions. I really know very little about my condition and about the tests and treatments he says I should have. First off, I'd like to know why a person at my young age, only forty-two, would have these chest pains.

There are many causes for pains in and around the chest; some are serious, and others are only minor problems. The outer layers of the chest are made of skin, bones, and muscles. Within the chest lie the trachea (windpipe), esophagus (gullet), heart, lungs, and the membranes that line the heart and lungs. Any of these can be a source of chest pain. Sometimes the cause is clear, but at other times a thorough investigation is required to solve the mystery. Often, clues to the cause of the pain can be found. Especially helpful is information about any activity that brings on or increases the pain. For example, pain on swallowing suggests that the esophagus is the source. If moving your shoulders, taking a deep breath, or pressing on your chest makes the pain worse, then these movements suggest that the trouble is in the ribs or the chest muscles. A common source of chest pain is the rib joints, located about two inches from either side of the breast bone. They often become sore from hard physical work, but even something as ordinary as carrying a couple of heavy grocery bags can start this kind of chest pain. This condition, called costochondritis, can be very painful, but the fact that chest motion and pressing on the area of tenderness makes the pain worse should help to assure one that the
source is not the heart. There are many variations to the patterns of pain and the causes; for example, pain on swallowing and deep breathing can also be an indication of inflammation of the linings surrounding the heart called pericarditis. You will certainly need the skills of your doctor to sort out the possible causes of chest pains.

Pain from heart disease is most often described as a dull pressure located in the front, at the center or just left of the center of the chest. Sometimes the pain travels to the inside of the left arm or up into the jaw. Often, when an actual heart attack has occurred, the victim will describe the pain as the worst feeling he or she has ever experienced: "It was like an elephant sat on my chest. I thought I was going to die." Heart attack pain usually lasts for several hours. Yet, surprisingly, you cannot always count on pain to warn you that the heart is in trouble: about 12 percent of people who have heart attacks feel little or no pain at all.¹ But these silent heart attacks are just as deadly as the painful ones.¹

Your description of your kind of pain is what I would consider typical of someone suffering with heart disease that has not yet caused serious, permanent damage or, in other words, a real heart attack. This type of chest pain is called angina pectoris, which actually means pain in the chest, or more simply, angina. The chest discomfort is similar to that of a heart attack: dull and in the front central part of the chest. Unlike a heart attack, the pain can often be brought on repeatedly by physical activity, such as climbing stairs, and sometimes by emotional upset. Relief follows a short period of rest, and the fact that the pain is less intense also distinguishes angina from a true heart attack. Whenever you have strong or repeated chest pain, you should consult a qualified physician to make the correct diagnosis and offer recommendations for treatment.

A session of angina can be almost as serious as a heart attack. The chance of dying for a person who has suffered a heart attack averages about 5 percent each year, after the first year.² For a person with angina the chance is only slightly less, every year 4 percent of these people with heart disease will die.³ Within five years the chance that a person with angina will suffer a nonfatal heart attack is 12 to 16 percent, depending on the severity of the heart condition.⁴ You should take your chest pains as a serious warning. And you should not be satisfied with any treatment that simply relieves the pain rather than correcting the cause of the problem. The medications your doctor prescribed are intended primarily for the relief of symptoms that are telling you that your life is in danger.

Fine, that's all well and good. But what is wrong inside my heart to cause this pain every time I try to do something?
Your pain is the result of an insufficient blood supply reaching the tissues of your heart in order to meet the needs of this powerful muscle for oxygen and the other nutrients it must have in order to do its work. The exact way in which the pain begins is still unknown but probably is related to the accumulation of products of metabolism within the heart muscle because of sluggish blood flow.

The arteries that carry blood to the heart muscle are called coronary arteries. In most cases the flow of blood is slowed down by narrowings in the central openings of these arteries. These narrowings are the result of a slowly developing and lifelong disease known as atherosclerosis. With atherosclerosis, plaques made of cholesterol, fats, muscle cells, and scar tissue fill the insides of the arteries, hindering the normal flow of blood. This formation of plaque begins in early childhood and in most people continues as long as they live. Eventually, this disease process becomes a threat to useful function, as well as to life, for the majority of Americans.

During times of physical activity or emotional upset, the heart rate increases and the heart muscle pumps harder. As a result, these tissues of the heart demand more blood. Because the arterial channels are too small to meet the demand for increased flow of blood, the deprived muscle begins to hurt, which is its message to you to stop whatever you are doing. Unfortunately, many people who have diseased coronary arteries are given no such warning. Low blood supply to the heart is present without symptoms of chest pain, in 25 to 40 percent of cases of the people who are already known to suffer from heart disease. In 2 to 4 percent of middle-aged men without any history of heart trouble, serious narrowings of the coronary arteries causing low blood supply to the heart muscle are present, but without any warning of chest pain. Therefore, as in the case of a silent heart attack, a person with silent angina may not realize that anything is wrong until it is too late, when he or she is already a victim of a complication, such as a heart attack or death, of this sinister disease.

You should understand that two ways are available to stop chest pains: either keep your physical and heart activity within the limits of your poor circulation, or improve the circulation to your heart. Drugs, surgeries, and diet and lifestyle changes approach the problem of chest pain from both directions.

I have noticed with exercise that I feel the most pain when I first start off. Is this a warning that I shouldn’t exercise?

Pain commonly occurs during the first few minutes after beginning vigorous physical activity such as walking, jogging, bicycling, or swimming. However, after this initial discomfort, many heart patients can perform
physical activities for prolonged periods without further pain. This is called the "warm-up phenomenon," and it is the result of an increase in blood flow to the heart muscle after the initial period of exercise.6

You must be careful about beginning any kind of exercise program, because the risk of sudden death while performing vigorous physical activities without adequate preparation is greater than during quieter activities.7 In someone suffering from severe atherosclerosis, the added demand for blood by a hard working heart muscle during vigorous exercise sometimes can tip the balance toward a fatal event, such as a heart arrhythmia or a heart attack. Many people who die suddenly while exercising have previous symptoms of heart disease, but others do not.8 In the general population, the risk of sudden death is small and should not keep people with heart disease from using exercise as a means of improving their general health and reducing their risk of heart attacks.9 But, exercise with caution! Start with relatively mild activities; then gradually build up to more demanding work. At the same time, attention must be paid to other factors that affect risk of heart attacks and sudden death, especially diet.

But I also feel chest pains at night when I’m lying down doing nothing. Can I do anything about this pain?

Fluids that have been accumulating throughout the day in your legs seep back into your blood vessels when you lie down, and as a result, the heart has more blood to pump. Also, while lying down, the return of blood to the heart is unimpeded by the forces of gravity. The extra return of blood to the heart causes the heart to pump harder. This in turn increases the heart muscle’s demand for oxygen and nutrients; chest pains may occur when the coronary arteries are severely narrowed and adequate flow of blood to the heart muscle is impeded. People who experience chest pain at night can find relief by raising the head of the bed about 10 degrees so that the heart is higher than the legs.10 In this position, you sleep while gravity helps to pull fluids away from the heart. Even after you get out of bed in the morning, considerable time may be needed for the excess fluids to leave the blood vessels and accumulate again in the leg tissues. For this reason, some people feel more angina in the mornings. A diet low in salt and fats is very important to lower the demand on the heart by keeping excess fluids from accumulating in the body and blood vessels.

On occasion, I’ve noticed a few skips in my heartbeat. Should I be taking some kind of medicine for that?

Irregular beats of the heart are called arrhythmias. They can be dangerous
when they are associated with such symptoms as chest pains or fainting. Extra beats that originate from the greater portion of the heart muscle are called *ectopic ventricular beats*. These arrhythmias are common in apparently healthy people and most of the time are not serious.\textsuperscript{11} Antiarrhythmic drugs are generally ineffective.\textsuperscript{11} In fact, sometimes the drug therapy is more dangerous than the irregular beats. However, you will need medical evaluation to determine the kind of irregularity your heart is having and the need versus the hazard of drug therapy.

Arrhythmias can be the result of a poor blood supply to the heart muscle and to other specialized tissues that conduct electrical charges through the heart muscle.\textsuperscript{11} Improvement in circulation can improve the heart's rhythm. Stimulating drugs, such as caffeine in coffee, tea, and chocolate, commonly cause irritability of the heart tissues. Prescription drugs, such as medications for heart conditions and asthma, antidepressants and stimulants, can also have the same effect.

**Will the tests my doctor has planned for me tell how severely my arteries are affected by atherosclerosis?**

Many different testing procedures are available to help your doctor determine the extent to which your coronary arteries are diseased. In most cases, testing begins with the safe and inexpensive ones first and then progresses to more expensive and riskier tests. The initial evaluation of a person like yourself with chest pain includes taking a history and having a physical examination, which includes an EKG while you are resting and tests of your blood for its content of cholesterol, triglycerides, sugar, uric acid, and thyroid hormones.

Often the next test a doctor orders for a patient with chest pains is a treadmill stress test, usually called simply a *treadmill* or a *stress test*. Essentially, this is an EKG performed while the patient is exercising, usually by walking on a moving belt. The treadmill stress tests are not very helpful in diagnosing coronary artery disease, because they add little to the physician's ability to pinpoint the cause of the condition by other means and because the results are frequently inaccurate. In most cases a person suspected of having heart disease can be diagnosed by evidence from his or her history and a resting EKG. The treadmill rarely makes the diagnosis any more definite, and this test adds a couple of hundred dollars to the cost of medical care.\textsuperscript{12-16} When heart disease is unlikely according to the patient's history and EKG, then the treadmill test provides little additional information and a positive test may introduce some new problems including missing the real cause of the patient's distress. Another serious concern is that when the test is read as positive in someone without heart
disease, in other words a false positive test result, this person may become psychologically upset from worrying about a condition he or she probably does not have, based on the history and EKG. Worse yet, a positive diagnosis frequently leads to more dangerous and expensive tests.\textsuperscript{15} False positive results are much more common in women than in men. In one large study 54 percent of the results in women were false positives compared to 12 percent of those in men.\textsuperscript{12} The detection and treatment of coronary artery disease by treadmill stress testing in someone without symptoms has not been shown to decrease the risk of sudden death from heart attacks or even heart attacks that are not fatal.\textsuperscript{16} Therefore, the stress test should be avoided by people who feel relatively healthy and have otherwise a low risk of having heart disease.\textsuperscript{12-16}

Some physicians feel that stress tests should be performed on men without symptoms of coronary artery disease if they are likely to have disease based on presence of risk factors for atherosclerosis and complications of coronary artery disease.\textsuperscript{14} These risk factors include positive family history for heart disease, hypertension, smoking, and elevated cholesterol. The number and severity of the risk factors that physicians feel warrants further examination with a treadmill stress tests varies considerably. Some physicians recommend this test to almost everyone as a screening procedure, while others reserve it for those who are at very high risk for heart disease. A study has not yet been done to determine if any correlation exists between the ease with which a doctor orders a stress test for the patient and the number of payments that are left on the $20,000 office treadmill equipment. Regardless of the results of a stress test, risk factors should be treated vigorously and no consolation should be gained by a negative test result.\textsuperscript{13}

Although treadmill stress testing may provide only marginal help in detecting significant coronary artery disease in patients with or without symptoms, the test does provide important information on the prognosis of the disease that could influence the course of treatment.\textsuperscript{16-18} A result that shows profound changes with only a little exercise may be an indication of the presence of severe coronary artery disease and will suggest that further tests should be done.\textsuperscript{15-18} A relatively normal stress test in someone having typical chest pains would be one indication that the arterial disease is not yet severe, and that further testing can be delayed.\textsuperscript{15-18} Furthermore, many doctors agree that patients with few treadmill stress test changes can be treated quite confidently without surgery.\textsuperscript{15-18}

What is the next test I should have if the treadmill is abnormal?

In an attempt to improve the usefulness of the treadmill test, a radioactive
solution can be injected into the bloodstream. A picture is taken by a specialized scanning camera in order to observe the flow of blood with its content of radioactive solution to the heart muscle. This procedure, called a radionuclide scan, costs several more hundred dollars and adds more information in the search for the cause of the chest pain. In one test the scanning is performed soon after the patient has finished running on the treadmill. The camera shows areas that are receiving too little blood for the amount of exercise being performed. Another kind of radionuclide scan is performed while the patient is still exercising. This procedure gives valuable information about the strength and motion of the heart muscle. A negative exercise radionuclide scan of either kind virtually excludes serious disease of the coronary arteries and puts a halt to further testing. In patients with known coronary artery disease a normal treadmill stress test and exercise radionuclide scan indicate a good prognosis for a hopeful future regardless of what the arteries would look like on more detailed studies. In 1981, an estimated 1.5 million cardiac radionuclide scans were done at a cost of $400-600 million.

What further testing might be needed if the treadmill and radionuclide scan indicate I have serious heart disease?

The next step in discovering the extent of coronary artery disease, the coronary angiography, is a serious one with significant costs and risks. The indications for an angiogram depend a lot upon the symptoms of the patients. Both a positive treadmill stress test and a positive radionuclide scan are required before making a diagnosis of serious coronary artery disease and performing coronary angiography in a person with atypical chest pains or no pain at all. Because a normal treadmill stress test and radionuclide scan in someone with known coronary artery disease is such a favorable sign there is rarely an indication to proceed with an angiogram with these findings. An angiogram should be done in the patient who is known to have coronary artery disease—because of typical chest pains, positive findings from an EKG, a treadmill, and/or a radionuclide scan—when symptoms are unacceptable despite medical treatment or the tests indicate that a large amount of heart muscle would be lost, and life would be in serious jeopardy, if the diseased artery in question closed completely. Angiograms are done in preparation for bypass or angioplasty surgery when the possibilities of such surgeries are likely.

A small-bore plastic tube is inserted into an artery of the leg or arm and is threaded through the vessel up to the heart. Then contrast material that can be detected by an X-ray machine is introduced through the catheter
into the coronary arteries that feed the heart muscle and the pumping chambers of the heart. X-ray pictures reveal in detail the extent of arterial closure by showing shadows of the plaques that line the insides of the arteries. The X-ray also provides some information about the movement and strength of the heart muscle itself. The risk of a person dying from heart disease is related to the number of blood vessels whose passageways are closed by more than 50 percent with atherosclerotic plaques. Blockage of each of the three major vessels that supply the heart muscle means a different kind of risk to the patient's life and health, depending on the extent to which it supplies the heart muscle.\textsuperscript{20-22} In addition, the more coronary arteries with serious disease, the greater the risks. Also, detecting abnormal motions of the heart gives evidence of poor muscle function and is a sign of poor outcome for the patient.\textsuperscript{15,22}

Complications of bleeding, strokes, and heart attacks are possible consequences of coronary angiography.\textsuperscript{23} Generally, the risk of death is much less than 1 percent and for serious complications less than 5 percent.\textsuperscript{23} However, estimates have been reported that are as bad as an 18 percent risk of developing serious complications and a 2 percent risk of death from this test.\textsuperscript{24} Your decision to submit to the procedure should not be made lightly. As the consumer patient, before you agree to the test you should clearly understand how its results will be used in making decisions about future treatment. Generally, the angiography should be reserved for patients who are really serious candidates for bypass surgery or a newer procedure called angioplasty.\textsuperscript{15,20} Cardiologists who perform this angiography make $800 on the average for each patient. In 1980 alone, more than $600 million was spent on coronary angiographies.\textsuperscript{19}

**How often does the angiogram find serious disease?**

In over half of the cases for whom coronary angiography is performed it leads to surgery. This is in part because the physicians who perform this procedure are careful to limit angiography to those likely to have disease and in part because advanced atherosclerotic coronary artery disease is almost the norm in the adult population in the United States. Studies at Cleveland Clinic using coronary angiography showed that nearly half of all men under the age of forty who underwent angiography for chest pains had extensive arterial disease.\textsuperscript{25}

For an individual patient with advancing years, the number of arteries involved and the number of plaques that are formed in each artery becomes greater, and the passageways through which blood is supposed to flow freely become smaller and narrower.\textsuperscript{26} And all the while our knives and
forks are pitching cholesterol and fats into the arterial walls! Here are the probabilities of finding serious atherosclerosis in one or more heart arteries of a man with an average blood cholesterol level of 210 milligram percent and a low level of triglycerides who has had angiography performed. An increase in cholesterol or triglycerides will increase the probability of finding disease. These values are even more meaningful when you realize that for nearly 25 percent of the cases the atherosclerosis was described as moderate, and for over 60 percent the disease was said to be severe.26 Severe and moderate atherosclerosis are the conditions that cause heart attacks and death. They are also the conditions for which surgeons operate.

<table>
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<tr>
<th>AGE (years)</th>
<th>PROBABILITY OF FINDING CORONARY ARTERY DISEASE (%)</th>
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<td>28</td>
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<td>30</td>
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<td>70</td>
<td>91.0</td>
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I’m not ready to give up my usual activities. Isn’t there some way to improve the circulation to my heart muscle, so that when I walk, the pain will not come so often or so strong?

Basic plumbing principles suggest several ways to deal with your clogged pipes. In 1967, coronary artery bypass grafting, usually abbreviated as bypass surgery, was introduced by doctors from the Cleveland Clinic.27 This technique removes dispensable veins from one of the patient’s legs and connects these vessels above and below the clogged sections of the heart’s arteries. These are detours, carrying blood past the narrow places in the arteries. When the vein from the leg, called the saphenous vein, is used, generally the upstream connection is made at the base of the aorta, the main artery leading from the heart. Then the blood vessel used for bypassing is attached downstream, past a blocked section in the artery.
this way, during a single operation, from one to eight (rarely more) bypasses can be performed on partially blocked coronary arteries and branches of these arteries in order to provide a greater supply of blood to the heart muscle.

Sometimes the *internal mammary artery*, which lies along the inside of the breastbone, will be used instead of a leg vein in order to bypass the constricted length of a coronary vessel. At present this artery is being used more often as the graft instead of the leg vein, because it seems to last longer.28
Tell me more about the bypass operation. This is what they refer to as major-major surgery, I’ve heard.

The operation begins with an incision in the skin, followed by splitting of the breastbone lengthwise with a bone saw. Then the chest is pried open and the sack enclosing the heart is opened to expose the beating heart. One tube from the “heart-lung” machine is inserted into the right atrium, or the right upper chamber of the heart. This tube serves to remove the blood from the body and deliver it to the heart-lung machine. Another tube is inserted into the aorta in order to return the blood from the machine to the body. The heart-lung machine performs the functions of the patient’s heart and lungs during the course of the operation, which may last several hours. While one group of surgeons is working over the organs in the chest, another surgical team is removing the saphenous vein from the leg.

In order to sew the vessels to the heart’s arteries, the heart muscle must be stopped for a very short while. A muscle-paralyzing, very cold, high potassium solution is infused throughout the coronary arteries. Meanwhile the heart-lung machine cools the blood which in turn cools the entire body with a refrigeration unit. After the necessary bypasses are sewn in place, refrigeration is stopped, the heart muscle and blood are warmed, and the life-giving natural beat is allowed to resume. Sometimes the heart muscle must be given an electrical shock to restart a normal rhythm. The chest wall tissues are sewn closed and the patient is moved to the recovery room.

The surgeon needs delicate skills for sewing the fine blood vessels in place so that blood will flow freely without even the smallest of leaks. For this exquisite control of techniques, the bypass surgeon receives from $3000 to $6000 for each operation, which in some cases may require only a few minutes of actual operating time for the head-surgeon. Bypass surgery is a $5-billion-a-year business that earns many surgeons $1 million and more annually. Acting almost by reflex, physicians send more than 200,000 trusting patients each year to such surgeons, asking to have their clogged arteries bypassed.

Sounds like a terrible way to spend an afternoon! I’m surprised people can live through such an operation.

Bypass surgery is a strenuous ordeal, even for patients in top shape. All too often, people submitting to this surgery are old and have been ill for a long time with heart, lung, and other diseases before such surgical intervention is tried. Death rates have been reported to be as high as 18 percent for people over the age of seventy. Under the best of circumstances the risk of death is about 5 percent in the elderly. On the other hand, modern medical technology must be credited with a death rate of only about 2
percent or less when skilled surgeons operate on relatively healthy younger patients.\textsuperscript{31}

I've heard that at least half of all bypass surgeries are done unnecessarily. But I'm sure my doctor won't make such a mistake with me.

Your doctor probably is caring for you with the most honorable of intentions, but he may not be aware of the high risks and the low benefits from this kind of surgery, much less about any alternatives for a patient with heart disease. On the other hand, a few doctors may not have the best intentions. Bypass surgery is big business, and physicians may have more to gain from it than you realize: increased income and fame, helping their hospital to keep its beds full, or supporting further personal or institutional expansion.\textsuperscript{32} Furthermore, in these days of innumerable malpractice suits, some physicians find safety in going along with the crowd. A doctor can never be accused of failing to provide treatment or to do everything medically possible when his or her patient is advised to accept bypass surgery. Surgeons who perform this delicate operation are very well-educated and can be most intimidating to patients and to colleagues in other branches of medicine. Rare indeed is the family doctor who is willing and knowledgeable enough to recommend a more conservative approach for heart patients. These are only some of the reasons why too much unnecessary bypass surgery is performed in too many communities today.

I'd like to hear more about the risks involved.

Usually, on the surface, everything seems to go well for most patients who receive the care of this truly advanced science of surgery and life support. But in most cases the results are not really worth the $25,000 price tag, much less the pain and suffering that are attached.\textsuperscript{29}

Many hazards are associated with any kind of extensive surgery. Major complications of one kind or another affect about 13 percent of patients.\textsuperscript{33} Reoperation for bleeding, infections, blood clots reaching the lungs, heart attacks, strokes, kidney failure, lung failure, gastrointestinal bleeding, psychotic reactions, and death are only some of the unplanned consequences of bypass surgery.

The thought of having a stroke really scares me. If there is one thing I don't want to be, it is living as a helpless invalid dependent on my family.

A stroke isn't the only thing that threatens your mental functions. There is also a frequent form of damage to the brain that has appeared with the introduction of open-heart surgery. The heart-lung machine is far from
being an ideal substitute for real hearts and lungs. Toxic chemicals, flakes of plastic from equipment, air bubbles, and clumps of fat and foreign material can be introduced into a patient’s bloodstream during bypass surgery.\textsuperscript{34-38} Injury to the blood cells also occurs as they pass through the tubes and oxygenating membranes of the machine. The relatively rough surfaces of plastic tubes and parts can damage many blood cells, and this injury causes the cells and other elements of the blood, especially platelets, to stick together in clumps.\textsuperscript{36,37} After being returned to the patient’s circulation, these damaged cells and clumps of blood elements, along with the flakes of foreign material and air bubbles, become stuck in the small blood vessels, and thereby block circulation of the blood. When that happens, blood with life-sustaining oxygen and nutrients is prevented from reaching the tissues, and injury and death of those tissues soon follows.

Studies show that nearly 100 percent of the patients who are placed on the heart-lung machine suffer some form of brain injury.\textsuperscript{37-39} As a result of this injury and other complications that occur during the bypass operation, up to 100 percent of patients have dysfunction of their central nervous system immediately after surgery.\textsuperscript{37} When examined at a later time, between 15 and 44 percent of people suffer detectable brain damage.\textsuperscript{36,40-44} The persistent dysfunction tends to result in minor degrees of intellectual impairment, memory loss, sleep disturbances, and a degree of personality change, a feature often noticed by relatives.\textsuperscript{40-44}

I think I’ve already got enough health problems. Now you’re telling me I might get brain damage from the surgery. I certainly don’t want that, but what choice do I have? This operation would save my life, wouldn’t it?

The risk to life, the pain and expense of the operation, and the possibility of permanent brain damage might be justified if bypass surgery led to a tremendous saving of lives. But unfortunately, the eighteen-year record for bypass surgery is nothing to brag about. Almost every review of the results of bypass surgery has concluded that this really heroic kind of surgery does not save lives when compared with simply giving patients drugs that relieve their angina.\textsuperscript{31,32,45-47} Some evidence suggests that these drugs may have increased the survival rate in addition to relieving chest pains, but the success of drug therapy as a means of prolonging a patient’s life with angina is small, at best.\textsuperscript{48} The decline in the death rate from heart disease in recent years is attributed mostly to changes in diet and lifestyle and improved medical care rather than to bypass surgery, or even drugs.\textsuperscript{49} Changes in diet and lifestyle are estimated to have accounted for 54 percent of the decrease in deaths from heart disease, while bypass surgery can be
credited for only a 3.5 percent of the improvement. Drug therapy takes credit for 10 percent of the savings.49

Here are the results of the three largest and most important studies on bypass surgery that have been made since it was introduced more than eighteen years ago.50

<table>
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<tr>
<th>STUDY REPORT</th>
<th>FIVE YEAR SURVIVAL RATES</th>
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<tr>
<td></td>
<td>SURGICAL</td>
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<tr>
<td>Veteran's Study</td>
<td>82%</td>
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<tr>
<td>European Study</td>
<td>93%</td>
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<tr>
<td>CASS Study</td>
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The results of survival for the Veteran's Study and the CASS Study are interpreted as being statistically the same for the medical and surgical treatment groups. After five years the death rates in the surgically, but not in the medically treated group, have been found to accelerate, making this small and largely insignificant difference in the survivals of these two treatment approaches even more disappointing for surgical treatment.50

Why doesn't bypass surgery prolong life? It sounds like such a logical solution to the problems of clogged arteries.

Atherosclerosis is a disease of all the blood vessels in the heart, even though one site is usually more extensively involved than are other sites. Although this disease is usually thought of as involving only the large heart arteries, we have no reason to think that the smaller vessels are functioning normally. Impairment of blood flow through a small blood vessel can still cause angina and can lead to either fatal or nonfatal heart attacks. Bypass surgery is only a patch job for the areas that are most obviously affected.46 Atherosclerosis continues to progress, unimpeded by bypass surgery, and the coronary arteries have the same or an even a worse tendency to get into trouble after the surgery. Add to this the number of deaths resulting from surgical procedures, and you have rates comparable to those from nonsurgical treatments. Another important reason why benefits from bypass surgery over medical treatment are hard to prove is that most people with atherosclerosis live a long time after diagnosis. Recently, death rates of less than 2 percent per year have been observed for patients who did not undergo surgery.31 This low rate is tough to beat.

After your explanation, to believe that bypass surgery cures atherosclerosis certainly would be naive. Does atherosclerosis affect the new vein grafts also?

Unfortunately, yes. Grafts can become nonfunctional in two ways. Within the first few days to months after surgery, the transplanted vessels have a
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A strong tendency to close up with blood clots, making them useless. About 10 percent of grafts are closed in two weeks and 20 percent are closed by the end of the first year after bypass surgery, and thereafter closure continues at a slow but steady rate.\textsuperscript{32,51,52}

The other way in which the grafts can fail is by the slow but progressive development of atherosclerosis. Ten years after surgery, one-third of the grafts are narrowed and another one-third are totally blocked by atherosclerosis.\textsuperscript{53} This should not be surprising, since surgery has actually done nothing to correct the cause of atherosclerosis. This progressing disease is believed to be caused mostly by high levels of cholesterol in the diet and the resulting cholesterol in the circulating blood. As might be expected, the chances for the new grafts to close off are directly related to the levels of cholesterol in the blood.\textsuperscript{53,54}

An alarming finding is that the progression of atherosclerosis is even more severe in coronary arteries that have had a bypass graft placed in them.\textsuperscript{55} The rate of disease progression of atherosclerosis has been found to increase by tenfold in blood vessels that have received grafts compared to those that were left untouched by surgery.\textsuperscript{55} This accelerated development of atherosclerosis may be due to changes in blood flow as a result of the bypasses.

This finding of accelerated atherosclerosis from placement of a graft should decrease the number of operations performed on blood vessels with small blockages, less than 50 percent narrowing. In the past, one reason that has been advanced for bypass surgery to minimally affected vessels is that it provides an auxiliary blood supply to the heart in the event of future growth of plaque in those vessels. However, because of the accelerated growth of plaque caused by the graft, a patient is much better off if a minimally affected vessel is left untouched.\textsuperscript{55}

Return of chest pains is often related to closure of grafts by such processes as formation of clots or atherosclerosis.\textsuperscript{51,56} However, when the heart is studied later by a repeat angiography, relief of chest pains is not always related to an open, functioning graft.\textsuperscript{57,58} Some investigators also have found little correlation between open grafts and satisfactory capacity for exercise.\textsuperscript{59,60} Even survival is not correlated with unblocked grafts.\textsuperscript{57} The lack of correlation between benefits and a successful operation puts into question the actual role of this specific surgery. If a patient reports that he or she is feeling better, even when the graft fails to function, then some factors other than improved circulation must account for these benefits subjectively felt.
Would it be possible to have another bypass if the first grafts closed off?

The problems are certainly not ended for the patients, once bypass surgery is finished. One-quarter of bypass patients return to the hospital within six months of their operation.61 Nearly 60 percent of the readmissions are for chest pain and other heart-related events.61 Repeat surgery accounts for from 2 to 6 percent (and more) of all bypass patients, and it is done in order to correct closed grafts and to do further bypass grafting of other untouched vessels.62 However, this kind of repeat surgery is a hazard for the patient and can be technically difficult for the surgeon. Scar tissues from the previous operation surround the heart and many of the sites suitable for grafting have already been used.

Aren't there any situations where bypass surgery will keep the patient alive longer?

The largest coronary artery, which is called the left main coronary artery, is particularly dangerous when diseased.52,63,64 This artery supplies a major part of the heart muscle, and if the blood flow to that part is suddenly closed off, a heart attack, and even death from the attack, usually follows. Death rates have been estimated to be as high as 10 percent per year for symptomatic patients with serious left main coronary artery disease treated without surgery.52,63,64 Fortunately, dangerous blockages in this artery affect only about 5 percent of patients who undergo angiograms.20,52 Most studies show better survival rates with surgical treatment than with medical treatment for this particular lesion in patients who have serious chest pain.52,63,64 However, surgery for patients with disease of the left main coronary artery who have only mild distress or no symptoms of chest pain is not accepted as the only, or the best, approach to the problem by all investigators.52,65-67

Another situation that many doctors believe is benefited by bypass surgery is severe disease that involves all three main arteries of the heart; for the same reason, a high risk of dying.68 However, more recent results with medical therapy have challenged the advantage of surgery for patients with extensive three vessel disease.69,70 One more thing that should be kept in mind when considering surgery as treatment for left main coronary artery disease and severe disease of all three vessels, is that the risk of both angiography and bypass surgery is much greater the more severe the disease.24,69

Even though the need for surgery for severe left main coronary artery disease is almost unquestioned by physicians and the belief that three vessel disease is best treated by surgery is widely held, there is an important and recent dissenting opinion from a respected group of researchers. You need
There are three large coronary arteries that supply the surface of the heart. The left main coronary artery provides the greater share of blood to the heart muscle; therefore a blockage of this artery can be highly lethal.

to be aware of this opposing opinion based on scientific study when deciding on your course of treatment along with your doctor's advice. Evidence from researchers from the Cardiovascular Laboratories, Harvard School of Public Health has shown that, even with severe coronary artery disease, good medical care along with changes in diet and lifestyle will give equal or better results than surgery. Their series included some patients with left main coronary artery closure of 50 to 80 percent, and many with severe disease of all three vessels. As I've mentioned, many physicians would consider these situations as absolute indications for bypass surgery. But these patients postponed surgery. With an annual death rate of only 1.4 percent among their patients, these investigators challenged the need for bypass surgery in even some of the most serious cases of coronary
atherosclerosis. Criteria for the need for bypass surgery is based on symptoms of coronary artery disease which interfere with the patient’s life and are unrelieved by medication-dietary-lifestyle changes, rather than results of the treadmill and findings of the condition of the coronary arteries on an angiogram.15,67

After all is said and done, how long I’m going to live is the most important thing to me. Is there some agreement among doctors about those situations in which bypass surgery will save the patient’s life?

The following table presents the general feeling among physicians about the survival benefits of bypass surgery as a treatment for most patients with heart disease:71,72

### SURGERY VS. MEDICAL MANAGEMENT

<table>
<thead>
<tr>
<th>CIRCUMSTANCE</th>
<th>PROLONGS LIFE</th>
<th>FAILS TO PROLONG LIFE</th>
</tr>
</thead>
<tbody>
<tr>
<td>One and two arteries diseased</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>All three arteries diseased</td>
<td>?</td>
<td></td>
</tr>
<tr>
<td>Left main coronary artery diseased</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Unstable angina</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Variant (Printzmetal) angina</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>After a heart attack (acute myocardial infarction)</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Cardiogenic shock</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Arrhythmias</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Congestive heart failure</td>
<td>X</td>
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Will this surgery stop my chest pain?

The most common reason why patients are sent to bypass surgery these days is chest pain that is not relieved by medical therapy. As may be expected, the primary benefit bypass surgeons claim for their efforts is the great job that the operation does in relieving chest pains, since they would have difficulty in claiming that lives have been saved. However, even the claim for pain relief is under considerable attack for several reasons. The 90 percent improvement or complete relief of chest pains that is reported one year after surgery decreases with the passage of time. Long-term follow-up of patients who have been operated on show that in five years
the proportion without symptoms has fallen below 70 percent, and after ten years less than half the survivors are without symptoms.73

Several important reasons can be found for the relief of chest pain after the operation that cannot be credited to this surgery.

Pain relief can simply be a placebo effect; in other words, it is not the result of any physical change or improvement in the patient but is entirely psychological in origin. This placebo effect was dramatically demonstrated by observations reported in a study published in 1960.74 In the 1950's a popular operation for angina was tying off the internal mammary artery located just under the breastbone. The theory supporting this approach maintained that it would divert more blood to the heart arteries and thereby relieve the chest pain. In order to evaluate the effectiveness of this procedure, an experiment was performed on eighteen patients, each of whom had a classic history of angina pectoris and a distinctly abnormal treadmill stress test or EKG. Five of the eighteen patients were given a sham operation; nothing more than a incision in the skin was made and then sewn up. The thirteen other patients had the internal mammary artery tied off according to the usual procedure. All patients reported improvement in their chest pains, some to the complete relief of angina, and also an improved ability to work. Yet they showed little improvement in their treadmill stress tests. The five who received the sham operation did as well as those in whom the internal mammary artery had been tied off during surgery. The conclusion is that there is a psychological benefit from simply being cut.

Another reason for pain relief is a heart attack in the part of the heart that was the source of the pain before the attack occurred. A heart attack results in the death of the portion of the heart muscle that was supplied with blood by the diseased artery. Dead tissues no longer hurt. Heart attacks have been reported to occur during or soon after operation in 5 to 50 percent of patients.75-78 However, with improved surgical techniques the number of serious heart attacks may be lowered to as few as 5 to 6 percent of the bypass surgeries.48 Obviously, this is not the preferred way to stop chest pains!

Relief of chest pains is also believed to be the result of severing the nerves around the heart during surgery. The combination of the placebo effect, heart attacks, and nerve damage from surgery will account for many of the patients who gain relief of chest pain from bypass surgery. Yet, in such patients who have no symptoms to warn them that something may be wrong, a dangerously compromised supply of blood to the heart muscle can still be threatening them.

Relief of chest pains can also be the result of improved circulation to the heart muscle—which, of course, is the purpose of bypass surgery.79
However, even successful surgery does not prolong life in most cases. I argue that removal of the warning sign—the chest pain—is a disservice to the patient. This unpleasant reminder that something is wrong can serve a person better as a strong motivation to improve their diet and lifestyle—a method which, as we shall soon discuss, can bring tremendous benefits.

My job and recreation are very important to me. Will I be able to do more if I choose bypass surgery?

One large study found a sevenfold increase in retirement for patients less than fifty-five years old who had previously been able to work, and an elevenfold increase for those over fifty-five after bypass surgery. Among physicians, the consensus is one of disappointment: improvement in job and recreational activities after surgery is generally not found. In contrast, among a series of patients who did not have surgery, a cardiac research team was able to improve performances of 90 percent of patients less than sixty years of age who had had recent heart attacks simply by relying on encouragement and rehabilitation.

Can’t a doctor just ream out my arteries without cutting me open? Sort of how they clean out a sewer pipe?

One alternative to bypass surgery is a technique called coronary angioplasty, introduced in 1977. This technique is an outgrowth of coronary angiography and uses a long plastic tube with a very small bladder at its tip that can be inflated and deflated by the operator. The operation begins with passing this small catheter tip into a section of blood vessel where atherosclerotic narrowing has occurred. Then the bladder is inflated with fluid, squeezing aside the plaque to enlarge the opening in the blood vessel. In most cases, this treatment allows an improved flow of blood to the heart muscle and relief of associated chest pain.

Results of coronary angioplasty are encouraging, judging by the relief of chest pain in 55 to 77 percent of cases, depending on the experience of the surgeon performing the procedure. Complications are serious in about 10 percent of patients, but this method is certainly less of an ordeal and an expense for a patient than bypass surgery. The major complications are heart attack in 5 percent of cases and death in 1 percent of cases. Unfortunately, there is also evidence that injury to the inside lining of the artery caused by the catheter results in an accelerated progression of atherosclerosis following the procedure. Angioplasty should be tried only in patients who otherwise would be sent to surgery. Also, because of the risk of complications with the procedure, immediate surgical help should be available. In 5 to 7 percent of cases, patients have to be hurried to
bypass surgery because of failure to improve the patient's condition or a complication. To date, studies have not been done to show improved survival rates for patients having angioplasty compared with those treated by medical-drug therapies or bypass surgery. However, the results are likely to be found comparable. Closing of the opened vessel accompanied by a recurrence of chest pain is the greatest problem for patients who undergo this procedure. About 30 percent of patients suffer reclosure of the vessel. Fortunately for them, repeat angioplasty is very successful in reopening many of these arteries after an initial failure. Even with allowances for reoperations, angioplasty is estimated to offer financial savings of 40 to 50 percent over bypass surgery.

Reclosure of the blood vessels is the same reason for failure after bypass surgery. Why don't these operations provide a more permanent solution?

The closure that occurs soon after either of these procedures is caused by sudden formation of blood clots. Aspirin and other blood thinning drugs
have had some success in keeping the grafts and arteries open longer.\textsuperscript{94} However, one of the most important factors that increases the tendency for clots to form is rarely changed—and this is the high content of animal fats in the American diet. Saturated or animal fats cause platelets, the blood-clotting elements, to form clumps, and they also activate clotting factors in the blood. As a result, the tendency to form blood clots is increased and the hard work of many a good surgeon is destroyed, not to mention the lives of the hopeful patients.\textsuperscript{95-99} Decreasing the intake of animal fats in one’s diet and increasing that of vegetable fats will quickly reverse this tendency toward excessive clotting. To avoid problems of obesity, blood sludging, bleeding, and possibly a higher risk of gallbladder disease and cancer, the best dietary change is simply to reduce the consumption of animal-type fats without increasing that of the vegetable fats.\textsuperscript{100}

Health professionals and patients will make little or no progress in their campaign against heart disease until the factors that cause the disease in the first place are eliminated. The primary factors in developing atherosclerosis are, first, dietary habits, which we can control, and, second, heredity, which we can do nothing about.\textsuperscript{101,102} Secondary factors, which are also very important and need our attention, include smoking, obesity, high blood pressure, physical inactivity, and emotional stress.

**How can physicians justify doing all this surgery if it doesn’t save lives?**

The fact is that bypass surgery should be reserved for a last-ditch effort. The official indication for recommending bypass surgery is angina, or chest pain that is unrelieved by medical therapy.\textsuperscript{15,31,103} In the minds of most physicians, good medical therapy consists of writing prescriptions, which, ultimately, give a patient a medicine cabinet full of antianginal drugs, including such preparations as nitroglycerin, beta blockers and calcium antagonists.\textsuperscript{31,103} However, much more can be done for a patient with atherosclerosis and angina.

More progressive doctors are paying close attention to the nutritional and lifestyle habits of their patients and are making sincere recommendations for their patients to stop indulging in tobacco, coffee, and alcohol; to lose excess weight; to exercise moderately; and to follow a low-fat, no-cholesterol diet. Most people with heart disease and angina should not even be considered for angiography, angioplasty, or bypass surgery unless all other approaches fail—diet, lifestyle, and recommended medications.\textsuperscript{15,31,103} Certainly, people who are faced, sooner rather than later, with the likelihood of a heart attack, extensive surgery, or sudden death, should be willing to eat better
Heart Disease

foods and adopt a lifestyle that will offer the best possible chance to resolve their problems and to recover from this potentially deadly condition. A change in diet will give the most satisfying results, and each of us has 100 percent control over the foods we eat.

Isn’t it too late, now that I have the disease, to change my diet and expect any benefit? Why do you believe diet has such a great influence on heart disease and angina?

Atherosclerotic diseases of the blood vessels occur almost exclusively in parts of the world where the diet is rich in fat and cholesterol, based on meats, dairy products, eggs, and refined and processed foods.\textsuperscript{101,102,104} Factors that cause disease also promote further disease. Studies have shown that the progression of arterial disease can be slowed or stopped with a decrease in blood cholesterol reached by proper diet and/or medications.\textsuperscript{105-107} If enough corrective measures can be made towards lowering the cholesterol level in the blood, then the atherosclerotic disease is actually reversible.\textsuperscript{107}

Is using diet a new treatment for heart disease and angina?

Not at all. Scientific studies relating to the dietary treatment of atherosclerotic heart disease and its accompanying chest pains date back to 1955. This long history may make you wonder why all the heroics of bypass surgery ever became popular, when such an effective and simple treatment was already available. Investigators from the University of Pennsylvania in the 1950’s treated their heart patients with a low-fat diet and obtained excellent relief of angina in a few days.\textsuperscript{108-110}

One important experiment demonstrated that a high-fat diet fed to heart patients brought on chest pains very quickly.\textsuperscript{109} Fourteen patients were fed a single high-fat meal and the result was fourteen attacks of angina in six of those patients in the next four hours. EKG changes confirmed that the pain was from the heart. No attacks of angina occurred when those same heart patients were later fed a low-fat diet having comparable volume and calorie content. Measurements of the oxygen content of the blood (PO\textsubscript{2}) in other patients fed a high-fat diet have shown a fall of 20 percent soon after that single meal.\textsuperscript{110} This lower oxygen content, combined with the sluggish flow of blood through the arteries narrowed by atherosclerotic disease, were the two factors that brought on pain.

A third factor that reduces blood flow to the heart muscle is the sludging of the blood cells that occurs when the fat from a meal enters the bloodstream. At the University of South Carolina Medical School, investigators observed this sludging in the blood vessels in the whites of patients’ eyes after a high-fat meal.\textsuperscript{111} This sludging effect was associated with the onset of chest
pains in those patients soon after they ate the meal. The effects of this burden of fats on the heart were confirmed by changes in the patients’ EKGs.

Recently, a study at the Baylor College of Medicine combined a low-fat vegetarian diet with a relaxing environment. The results of observations of twenty-three heart patients were published in 1983 in an issue of *The Journal of the American Medical Association.*\(^\text{112}\) The investigators found a 91 percent reduction in frequency of angina attacks and a 55 percent increase in work capacity after only twenty-four days of this cost-free, pain-free kind of treatment. Cholesterol levels also decreased by 20 percent, on the average, during this three-week alternative diet. It’s nice to know that there are no complications to this treatment, as well as a 40 percent reduction in food bills.

Further investigations into the benefits of a low-fat diet on the metabolism of the heart have recently been published.\(^\text{113}\) Patients with angina were treated with a low-fat diet for three months. After the dietary treatment, these patients could walk for a longer time before chest pains began. Definite improvements in the energy metabolism of the heart muscle were observed as a result of a low-fat diet. Cholesterol levels, incidentally, dropped by an average of 28 percent.

The effectiveness of a low-fat diet and exercise in the management of coronary artery disease was recently tested at Brigham and Woman’s Hospital, Boston.\(^\text{114}\) Results of thirty-two patients who participated in a diet and exercise program for ten to sixteen weeks showed a reduction in body weight, blood cholesterol and triglycerides. There was a significant improvement in work capacity and reduction in systolic blood pressure. Patients had almost 22 percent less angina occurring during exercise stress testing than before the program. The diet, not the exercise or the drug therapy, was believed to be the determining factor in the angina improvement.

Other investigators have shown benefits for heart patients suffering from angina who changed their diets and lifestyles.\(^\text{115,116}\) More studies everyday are appearing in the medical journals that confirm the essential part played by diet and lifestyle changes in the rehabilitation of a victim of heart disease. In fact, state-of-the-art health care is not being provided for the patient if these changes are not emphasized as first line therapy in medical care and postoperative care of bypass and angioplasty patients.

**Would a proper dietary change also improve the survival of medically treated patients if this change was commonly prescribed by doctors?**

Many studies have been performed during the last forty years to determine
whether or not survival of heart patients can be improved by a change to
a low animal-fat diet and a subsequent reduction in blood cholesterol
levels.\textsuperscript{49,101,102,117-121} The results have been very encouraging, but until very
recently they were not convincing enough for most physicians. In January
1984 “The Lipids Research Clinics Coronary Primary Prevention Trial
Results” were released by the National Heart, Lung, and Blood Institute.\textsuperscript{120,121} This study showed a definite decrease in numbers of deaths from heart
disease when subjects achieved a drop in blood cholesterol levels. Evidence
was also provided that suggested a decrease in the need for bypass surgery
in the treated group and a reversal of atherosclerosis. The scientific literature
is reporting more all the time now about the benefits of changes in diet and
lifestyle, and how these changes can replace medications and surgery with
better results.

See if these comparisons can help you to decide which is the best choice
for you:

\begin{center}
\textbf{COMPARISON OF MEDICAL-DIETARY AND SURGICAL
MANAGEMENT OF HEART DISEASE}
\end{center}

\begin{center}
\textbf{TREATMENT}
\end{center}

\begin{center}
\begin{tabular}{|l|c|c|}
\hline
\textbf{FACTOR} & \textbf{BYPASS} & \textbf{ANGIOPLASTY} \\
\hline
Operative mortality & 2\% & 1\% \\
(elderly) & 5\% & \\
\hline
Operative complications & 13\% & 10\% \\
Operative heart attacks & 5\% & 5\% \\
Blood transfusions likely & yes & no \\
Operative brain injury from & 100\% & zero \\
heart-lung machine & & zero \\
Persistent brain & 15 + \% & zero \\
dysfunction from heart-
lung machine & & zero \\
Cost of operation & \$25,000 + & \$10,000 + \\
Closure of grafts (early) & 20\% & 30\% \\
Operative pain and & 100\% & 100\% \\
suffering & & zero \\
Stress on family from & 100\% & 100\% \\
surgery & & zero \\
\hline
\end{tabular}
\end{center}
I would eat cardboard to keep myself away from the surgeon’s knife. I’m certainly glad you’ve given me a scientifically backed alternative to rushing off to surgery.

If there were an ideal therapy that gave consistent excellent results without risks or adverse effects, then there would be no room for discussion or decision. Unfortunately, this ideal is unlikely to be achieved. Studies comparing results of medical and surgical treatments have shown not only that medical treatment is as good for most patients but also that surgery can be put off safely until later, if not forever, and that the more conservative, less painful, less expensive approaches should be tried first. Surgery, rather than medical-dietary therapy, should be employed only if the advantages of the operation justify the risks, costs, and psychological stress to the patient. In most cases they don’t!
Prevention of heart disease with a low-fat, no-cholesterol, high-fiber diet, moderate exercise, and a health-promoting lifestyle should be everyone’s goal.

If you develop chest pains, go to your doctor in order to find their cause. An internist or a cardiologist would be the best physician to consult. If you are very ill, you may need to be hospitalized. Demand low-fat, no-cholesterol foods while you’re in the hospital. No sense in allowing the hospital’s dietary department to impair your heart’s circulation any further. Besides, at no other time is your level of motivation likely to be any higher; you might as well begin immediately with this sensible changeover.

From your history and EKG your doctor should have a good idea whether or not the pain is from coronary artery disease.

If your doctor suspects that you do have coronary artery disease, then your primary goal should be to stop the pain so that no further testing or surgery will be necessary, at least for the present. This relief of chest pain is best accomplished by an immediate change to a low-fat, no-cholesterol, low-salt, high-fiber, high-complex-carbohydrate diet.

When you are feeling better, start a program of moderate exercise. Increase your activity as you feel stronger. Exercise just short of the point where pain develops.

If the angina persists, take antianginal medication. Nitroglycerin pills are easy to use and effective. With them, you take the medication only when you need it instead of routinely, as is necessary with other medicines. The next set of drugs to try for relief of pain are the beta blockers and the calcium antagonists. If you do take these long acting medications and your pain is relieved, do not be lead into believing your disease is healed. The medication does not stop the relentless progress of atherosclerosis.

Somewhere in the evaluation of your chest pain and the likelihood of disease of your coronary arteries, you should have a treadmill stress test to evaluate the severity of your condition and determine the need for further testing and treatment.

If the treadmill stress test is normal, or shows only minor changes, then you have little reason to rush into angiography or surgery. If the angina continues with a normal treadmill stress tests, you along with your doctor should persist with the diet and drug therapy.

If the treadmill stress test is very abnormal, suggesting serious coronary artery disease, then you will need further testing to determine the severity of the disease. The next test recommended is a radionuclide heart scan.
• A negative treadmill stress test and exercising nuclide scan virtually exclude serious coronary artery disease. However, if these tests are positive then the next step is angiography.
• Both a positive treadmill stress test and a positive radionuclide scan are required before making a diagnosis of coronary artery disease or performing a coronary angiography in someone with an atypical history of chest pain or in someone with no pain at all.
• Angiography is performed as a precondition to bypass or angioplasty surgery in cases of known coronary artery disease already selected on the basis of continued symptoms or evidence of involvement of a large area of the heart muscle based on severely diseased vessels as determined by treadmill stress tests and/or radionuclide scan.
• Severe artery disease, determined by angiography, that involves the left main coronary artery or all three of the major coronary arteries, is believed by most physicians to be best treated with surgery. Also if a portion of the heart muscle, called the ventricle, functions poorly, then surgery is believed to give better results than medical therapy. Remember, that some highly respected investigators still feel that surgery is not always the best treatment for everyone, even for left main coronary artery disease and extensive three-vessel atherosclerosis. The decision for surgical intervention with bypass or angioplasty should be weighted by chest pain and other symptoms of coronary artery disease unrelieved by medical therapy, not on the basis of the disease seen in the heart arteries on angiography.

This is your decision to make, and you have the most to gain or lose from the treatment you select. But take the time to have your cardiologist explain the risks versus the benefits to you, clearly and carefully.
• If you can’t find relief from the chest pains, severe enough to interfere with your life, by a diet-lifestyle-drug approach, then angiography followed by angioplasty or bypass surgery may be your last, and best, and only choice. Angioplasty, if applicable, is a better choice than bypass surgery.
• If you have already had bypass surgery, you should be eating a low-fat, no-cholesterol diet. You should also exercise and give up unhealthy habits; otherwise, you are likely to get into trouble again.
• You most likely will need to reduce the dosage and/or discontinue medications after you change your diet and lifestyle. This should be done under your doctor’s supervision.
• Whenever you have chest pain that is severe and long-lasting, go for emergency treatment. This may be the beginning of a heart attack.
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