

FROM AMERICAN HEART ASSOCIATION BYPASS SURGERY

DESCRIPTION

A coronary artery bypass graft, often referred to as a CABG (pronounced "cabbage") or simply as a bypass, is a heart surgery in which blood is rerouted to "bypass" clogged arteries and to improve the supply of blood and oxygen to the heart. During bypass surgery, surgeons take an artery from the upper chest or a blood vessel from another part of the body and construct a detour around the blocked part of the heart (coronary) artery. CABG may be used both in the treatment of acute coronary disease, such as a heart attack, and in the treatment of chronic coronary artery disease.

While CABG allows blocked and narrowed blood vessels to be bypassed to improve blood flow beyond the treated area, it does not treat the underlying process that causes the narrowing and hardening of blood vessels. Risk factor and medical management can help reduce the progression of the disease process.

In the treatment of chronic CAD, the decision to perform a CABG is based on a number of factors which must be considered by your physician and cardiac surgeon. This decision is typically made based on the results of cardiac tests such as a stress test (exercise test or treadmill test) and a cardiac angiogram (cardiac catheterization). These tests may be performed based on abnormalities discovered at the time of a routine exam or based on your report of changes or worsening of your pattern of chest pain/discomfort, or the development or worsening of other related symptoms, such as shortness of breath. Conditions that affect your doctor's decision to proceed with a CABG include the severity and extent of the disease, worsening symptoms, or poor pumping function (low ejection fraction).

SURGICAL METHODS

The surgeon can construct the bypass using the vein from the leg (saphenous vein), an artery from the forearm (radial artery), or artery from the chest (the mammary artery). Under some circumstances, other blood vessels may be used.

Regardless of the vessel used, the result is that blood can flow freely through the new pathway to the heart muscle. The standard surgical technique uses a heart-lung machine (cardiopulmonary bypass machine). At the beginning of the surgery, the breast plate is opened, tubes are placed in the major artery (aorta) and major vein (vena cava), and the blood is diverted through the cardiopulmonary bypass (CPB) machine. The CPB takes over pumping and oxygenating the blood. Meanwhile, the surgeon is able to clamp the aorta and stop the heart. Stopping the heart allows the surgeon to perform the delicate surgery while the heart remains motionless. This is known as "on pump." A blood flow specialist (perfusionist) monitors the cardiopulmonary bypass (CPB) machine during the surgery.

The standard bypass procedure using the CPB machine relieves chest pain but also has some significant potential complications. As the blood passes through the cardiopulmonary bypass machine, blood cells can be damaged and the blood's ability to form clots is reduced. Blood transfusions may be required. The blood stream may also pick up air, pieces of plastic, and small blood clots as it passes through the machine. Additionally, during standard CABG, the aorta is clamped once the CPB machine is connected. Clamping of the aorta stops the blood flow to the heart, meaning that the heart is without blood for a short period of time.

Less Invasive CABG options

In recent years, new CABG techniques have been developed to reduce the invasiveness, complications, and recovery period of bypass surgery. Alternative techniques have been developed to avoid the use of the CPB machine, avoid or decrease the use of medications to stop the heart beat, and/or use smaller incisions.

developing coronary heart disease and additional health problems. Your BMI is 31.

In addition to being a risk factor for heart disease on its own, obesity contributes to other cardiac risk factors and health problems:

- It raises blood cholesterol and triglyceride levels.
- It lowers HDL "good" cholesterol.
- It raises blood pressure.
- It can induce diabetes. In some people, diabetes makes these other risk factors much worse. The danger of heart attack is especially high for diabetics.
- It is a risk factor for gallstones.
- It can worsen degenerative joint disease.

You can reduce your health risks by reducing your weight. Strategies of effective weight loss plans include:

- Make a plan and follow it. This should include a visit to your doctor to discuss your weight loss plans.
- Gain support. Find others who can encourage you and support you as work toward your weight loss goal.
- Follow a consistent nutritional plan. It may be helpful to talk with a nutritionist or dietician to help create a meal plan.
- Increase your physical activity - try to get at least 30 minutes of physical activity, such as walking, on most days. At first this may seem difficult, but start with less and work your way up. Be sure to talk with your provider before starting an exercise program.

When first starting a weight management program, it is important to set realistic goals. For instance, if you do not exercise at all, it is probably more realistic to start with a goal of brisk walking 10 minutes 3 days a week than to plan to run 30 minutes every day. You can work your way up to higher goals with time. There are many excellent guides for weight management available. For more information go to these other online resources:

American Heart Association: www.americanheart.org

American Obesity Association: www.obesity.org

Lipid Abnormalities

Lipids are fatty, waxy, or oily substances that are necessary for normal function of the body. Lipids include triglycerides and cholesterol, and are carried in the bloodstream by special carrier particles called lipoproteins. Even though lipids are necessary, sometimes they can cause problems. An excess of lipids in the blood (hyperlipidemia) is a major cause of coronary artery disease (CAD), which leads to heart attack. In fact, as many as one third of adults with hyperlipidemia have evidence of CAD.

Low-density lipoprotein (LDL) is the major cholesterol carrier in the blood. If too much LDL cholesterol circulates in the blood, it can slowly build up in the walls of the arteries feeding the heart, brain, and extremities. Together with other substances, it can form plaque, a thick, hard deposit that can clog those arteries. This condition is known as atherosclerosis. If a clot (thrombus) forms in the region of the plaque or a piece of the plaque breaks off, the flow of blood to the tissue beyond the blockage is stopped. If this happens in an artery that supplies the heart muscle, it will cause a heart attack. If the flow of blood to part of the brain is cut off, the result is a stroke. An elevated level of LDL cholesterol increases the risk of atherosclerosis. That is why LDL cholesterol is often called "bad" cholesterol. Decreasing LDL cholesterol can decrease the risk of coronary artery disease and other cardiovascular diseases.

About one-third to one-fourth of blood cholesterol is carried by high-density lipoprotein (HDL). It is believed that HDL cholesterol removes excess LDL cholesterol from plaques, slowing their growth. HDL cholesterol also appears to carry cholesterol to the liver, where it is passed from the body. HDL cholesterol is known as "good" cholesterol because a high level of HDL cholesterol seems to protect against heart attack. The opposite is also true: a low HDL cholesterol level (less than 40 mg/dL for a male, 50 mg/dL or less for a female) is associated with a greater risk of heart attack.

Triglycerides are the chemical form in which most fat exists in food as well as in the body. Excess triglyceride in blood plasma is called hypertriglyceridemia. It is linked to the occurrence of coronary artery

MID-CAB

The goal of MIDCAB is to accomplish the bypass surgery through a smaller incision without the need for the heart-lung machine. It is performed while the heart is still beating, although medications may be used to slow or briefly stop the heart. Due to the nature of the procedure, its use is generally limited to patients requiring bypass in only one or two arteries that can be directly visualized through the incision. Clogged arteries on the sides or back of the heart may not be accessible.

The cardiac surgeon usually detaches an artery from inside the chest wall and re-attaches it to the clogged coronary artery which is directly in view. The advantages of MIDCAB include decreased blood transfusion requirements and quicker recovery. However, early results showed that the grafted vessels tended to be less unobstructed with traditional CABG than with MIDCAB. This has improved with experience and the use of special devices designed to hold the heart still.

VERY IMPORTANT --DISCUSS OPCAB THIS WITH DRS!!!!!!**Off pump coronary artery bypass (OPCAB)**

One of these techniques is called "off-pump" CABG, or OPCAB. As its name implies, this bypass procedure does not use the cardiopulmonary bypass pump. Until the introduction of new technologies, use of the bypass pump was required in order to easily attach the graft vessel to the narrowed coronary artery. OPCAB, also called beating heart surgery, is not appropriate for all patients, but it is an available option for a select group of CAD patients.

The use of medications to slow the heart such as esmolol and adenosine and the introduction of the cardiac stabilizer, an instrument that can hold the beating heart steady, provides an opportunity to bypass the blockage of coronary arteries while the heart is still beating. The availability of such technologies allows for the elimination of the cardiopulmonary bypass pump and its associated complications. One advantage of the OPCAB procedure is that it frequently requires less use of all blood products than on pump bypasses. Studies have also shown that the indicators of cardiac cell damage, cardiac enzymes, are reduced. Fewer complications result in some advantages of OPCAB over standard CABG including shortened hospital stays and lower cost. Preliminary studies show there is little difference in outcome between standard CABG and the OPCAB procedure in selected cases. Larger studies are still needed to determine which patients will get the most benefit from OPCAB and what the size of that benefit may be.

Port-access coronary artery bypass (also referred to as PACAB or Port-CAB)

The PACAB utilizes small incisions in the chest wall through which metal tubes, or "ports", are placed. Special instruments are then passed through the ports to perform the procedure. Another, slightly larger incision is created to allow the placement of a telescopic camera into the chest cavity so the surgeon can watch the procedure on a video monitor rather than directly. A cardiopulmonary bypass (CPB) machine is used in this procedure, however, instead of using the great vessels, the connection tubes are typically placed into the thigh vessels (femoral) at the groin. A thin tube is passed through blood vessels until it reaches the junction of the aorta and the heart. A balloon at its tip is then blown up to block the blood flow of the aorta and the heart is stopped for the procedure. Modifications and refinements of this technique continue to be developed. Similar types of procedures are also being developed for heart valve replacements. Studies are needed to compare the overall results of OPCAB with those of the traditional CABG surgery.

Ongoing areas of study

Cardiac surgeons continue to work towards the goals of minimal invasion with maximum benefit. This includes refining existing surgical procedures; combining procedures where appropriate, and developing new methods to restore blood flow to the heart. One ongoing area of investigation is in the direction of robot-assisted surgery. It is somewhat similar to PACAB in that specialized instruments are used to complete the bypass. The differences involve the use of a combination of standard techniques with robot-assistance such as voice-activated cameras and the use of a remote console to precisely guide the

action of the robotic arms with attached surgical instruments. Using the robotic assistance, a bypass can be performed with microsurgical techniques on a beating heart.

As new techniques develop, they are typically available only at a limited number of facilities and only available to a select group of patients. As the techniques are refined and their long-term safety is demonstrated, they may become more widely available. This process, however, takes many years to complete. In the meantime, standard CABG has a high success rate and has been shown to remain successful over the long term.

SIDE EFFECTS

Side effects of coronary artery bypass surgery can include pain, infections, stroke, kidney problems, bleeding, arrhythmia, respiratory problems including pulmonary embolus (blood clot in the lung), and cardiac tamponade, which is compression of the heart by large amounts of fluid or blood within the membranous sac containing the heart (pericardium) that limits the normal range of motion and function of the heart. These are discussed in more detail in the side effect section below.

POST OPERATIVE CARE

After a traditional bypass operation, it is common to spend a day or two in the intensive care unit being closely monitored before being transferred to a nursing unit where they can complete their in-hospital recovery. Walking or other physical activity is encouraged shortly after surgery to help reduce postoperative complications and regain strength.

It may take as long as 6 to 12 weeks to completely recover from the surgery. One of the major components of recovery is the complete healing of the sternum (breast bone). Patients are advised to avoid activities that place pressure on the sternum for at least 6 weeks. These activities include driving, golfing, tennis, racquetball, swimming, all contact sports, and any activity that requires potential sudden or forceful movement of the arms, shoulders or chest. Once the sternum has completely healed patients may resume full physical activities.

Most patients experience a good quality of life following CABG. Most are able to return to work, travel, and partake of the activities they enjoyed before the development of their heart disease. Sedentary jobs can be resumed in about 4 to 6 weeks. Restarting more strenuous jobs may take up to 12 weeks. Occasionally, a patient may need to find a new job if the old one was too strenuous. Sexual activity can usually be resumed in 3 to 4 weeks providing positions are chosen so that avoid weight being placed on the arms and that the patient can climb 2 flights of stairs without chest pain. Individuals heal at their own rates, your surgeon should be able to give you more specific guidance.

After surgery for the treatment of coronary artery disease, most patients feel much better with general improvement of symptoms. It is important to remember that CABG is used to relieve the symptoms of coronary artery disease (CAD) and/or to prolong life in patients with CAD, however, surgery does not cure CAD.

Once your physician is assured of your post surgical stability, a supervised cardiac rehabilitation program may be prescribed to help you return to a normal, active lifestyle. It is very important to reduce cardiac risk factors and start comprehensive follow-up program. Lifestyle changes including quitting smoking, regular exercise, dietary changes, and weight management are strongly recommended. Diabetes management, blood pressure control, and cholesterol reduction are essential. Medical management of CAD is an important part of risk reduction. Regular physician visits and diagnostic procedures are critical as well.



Disclaimer:

This section is offshoot of my gathering of news items about memory. I am not a medical expert. My background is in psychology. The information I have gathered here should not be taken as providing any advice.

Summary

Short-term declines in cognitive function can occur in elderly subjects after surgery, and persists in a small percentage.

Heart bypass surgery in particular is associated with cognitive decline - estimates of its prevalence range from 33% to 82%. This decline may persist in as many as 42% of patients. Age and level of education are both factors in determining the likelihood of long-term decline. The presence of a gene (apolipoprotein E4) carried by some 25% of the population may also increase the likelihood of decline after bypass surgery. There also seems to be a link between post-operative fever and cognitive decline. Long-term decline in cognitive function may be more a result of cardiovascular risk factors than the surgery itself.

High blood pressure in those over 60 seems to be associated with greater risk of cognitive decline.

High blood pressure and other circulatory problems, such as cardiovascular risk factors and diabetes, are linked to cognitive decline, perhaps through causing abnormalities in the white matter of elderly persons' brains.

Those with the gene ApoE4 also appear to have more difficulty recovering from traumatic brain injury.

Two drugs used for Alzheimer's have also been found to help those suffering from dementia following stroke.

A specific skills approach is having some success in helping those who suffer from attention problems following stroke.

cardiovascular risk factors

Cognitive decline after bypass surgery appears more transient than feared

Age-related changes in the brain's white matter affect cognitive function

Cognitive impairment following bypass surgery may last longer than thought

cognitive decline after heart bypass

Lower temperatures improve outcomes after bypass surgery

Cognitive decline after bypass surgery appears more transient than feared

Lowered immunity puts older coronary bypass patients at higher risk for cognitive decline

Cognitive impairment following bypass surgery may last longer than thought

Fever immediately after heart bypass surgery associated with cognitive decline

Gene linked to increased risk of memory loss after head injury or bypass surgery

Frequency of cognitive decline after bypass surgery

drugs

Statins associated with rare cases of temporary amnesia

Nicotine patch may alleviate 'senior moments'

JM NOTE: there seems to be a reputable study to prove any number of results.

high blood pressure

Risk for lowered cognitive performance greater in people at high risk for stroke

High blood pressure may be a factor in "senior moments"

Effects of high blood pressure on cognition may have been overstated

Treatment to lower blood pressure reduces risk of cognitive decline in stroke patients

Sunflower seeds helpful in reducing hypertension and associated cognitive impairment

Diabetes and high blood pressure both risk factors for cognitive decline

High blood pressure increases risk of cognitive decline

brain injury, stroke

Saving the most vulnerable brain cells in stroke

Risk for lowered cognitive performance greater in people at high risk for stroke

Chinese herb effective in treating vascular dementia

Pilot study finds ginseng may improve memory in stroke dementia patients

Right side of brain learns language skills after stroke

Memory loss after brain injury worse when E4 form of Alzheimer's gene present

ARICEPT® helps patients with vascular dementia

Reminyl may be effective in treating dementia in patients with cerebrovascular disease, such as stroke

Skill-specific exercises better for people who suffer from attention problems following stroke or brain injury

depression

Treatable depression often accompanies mild memory loss

News reports

cardiovascular risk factors

May 2003

Recent studies have found a high occurrence of cognitive problems in patients who undergo coronary artery bypass surgery, with such problems still found six weeks after surgery. In a new study comparing 140 patients who underwent bypass surgery and a second group of 92 coronary artery disease patients who did not have surgery, no differences in cognitive abilities were found when patients were re-tested at three and 12 months. This supports recent research suggesting that it is the disease itself that is the major problem, rather than the surgery.

The report appeared in the May issue of *The Annals of Thoracic Surgery*. Full reference
http://www.newswise.com/articles/2003/5/COGNITIVE_JHM.html
http://www.eurekalert.org/pub_releases/2003-05/jhmi-gn050603.php

March 2003

From around age 60, "white-matter lesions" appear in the brain, significantly affecting cognitive function. But without cognitive data from childhood, it is hard to know how much of the difference in cognitive abilities between elderly individuals is due to aging. A longitudinal study has been made possible by the Scottish Mental Survey of 1932, which gave 11-year-olds a validated cognitive test. Scottish researchers have tracked down healthy living men and women who took part in this Survey and retested 83 participants. Testing took place in 1998, when most participants were 78 years old.

It was found that the amount of white-matter lesions made a significant contribution to general cognitive ability differences in old age, independent of prior ability. The amount of white-matter lesions contributed 14.4% of the variance in cognitive scores; early IQ scores contributed 13.7%. The two factors were independent.

Although white-matter lesions are viewed as a normal part of aging, they are linked with other health problems, in particular to circulatory problems (including hypertension, diabetes, heart disease and cardiovascular risk factors).

Full text of the article is available at

http://www.apa.org/journals/pag/press_releases/march_2003/pag161140.html

The report appeared in the March issue of *Psychology and Aging*. Full reference
http://www.eurekalert.org/pub_releases/2003-03/apa-aci031703.php

July 2002

More support for a link between cardiopulmonary bypass surgery and cognitive impairment comes from a new study. In particular, it seems, that attention may be most affected. The study also found evidence of longer-lasting cognitive decline than previously thought. Bypass patients also demonstrated poorer cognitive performance before the surgery, and it is now being suggested that it may be the disease itself that is the major problem, rather than the surgery itself. This is consistent with recent research connecting cardiovascular risk factors with risk factors for cognitive decline.

The study appeared in the July issue of *Neuropsychology*. Full reference
http://www.eurekalert.org/pub_releases/2002-07/apa-lci070802.php

Full text available at

http://www.apa.org/journals/neu/press_releases/july_2002/neu163411.htm

cognitive decline after heart bypass

April 2004

Lower temperatures improve outcomes after bypass surgery

One of the possible adverse effects of cardiac bypass surgery is cognitive decline. Researchers have found that patients who were allowed an

additional 10 to 12 minutes to return to normal body temperature after surgery scored almost one-third better on standard tests of cognition six weeks after surgery. (In order to protect the brain and other organs from damage while the heart is stopped during surgery, physicians cool a patient's blood as it passes through a heart-lung machine. However, toward the end of the operation, this blood needs to be rewarmed.)

The results were presented by Hilary Grocott on April 26 at the annual scientific sessions of the Society of Cardiovascular Anesthesiologists. http://www.eurekalert.org/pub_releases/2004-04/dumc-lti042004.php

May 2003

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The report appeared in the May issue of The Annals of Thoracic Surgery. Full reference

<http://www.newswise.com/articles/2003/5/COGNITIVE.JHM.html>

http://www.eurekalert.org/pub_releases/2003-05/jhmi-gn050603.php

February 2003

Older patients with lowered immunity to certain common bacteria found in the gastrointestinal tract are more likely than younger patients to suffer cognitive decline after coronary artery bypass surgery.

The report appeared in the February issue of Stroke. Full reference http://www.eurekalert.org/pub_releases/2003-02/dumc-lip020303.php

February 2002

Elevated temperatures within 8-10 hours after surgery are often seen in patients who have undergone coronary bypass surgery. This has not however been regarded as anything other than a nuisance. Many bypass patients also suffer measurable cognitive decline. A new study reports on a relationship between these fevers and cognitive decline six weeks following surgery. Patients who suffered the highest post-

operative temperatures also suffered the highest amount of cognitive decline.

The study was published in the February 1 issue of Stroke. Full reference

http://www.eurekalert.org/pub_releases/2002-01/dumc-fia012802.php

Researchers have found an association between nerve cell changes associated with aging and the presence of a variation of the apolipoprotein gene known as apolipoprotein E4 (APOE4). This form is carried by approximately 25% of the population and has been linked to increased risk of Alzheimer's disease, cardiovascular disease and memory loss after head injury or bypass surgery.

The findings were presented at the 15th annual meeting of the American Association for Geriatric Psychiatry in Orlando, Florida.

http://www.eurekalert.org/pub_releases/2002-02/dumc-git022502.php

February 2001

Heart bypasses are becoming increasingly common - in the U.S., more than half a million people undergo coronary-artery bypass grafting (CABG) each year. A common side-effect of the procedure is

postoperative cognitive decline (frequency of occurrence estimates range from 33% to 82%, depending on the method of evaluation used).

A recent study looked at the longer-term picture: In this study, cognitive decline was found in 53% of the patients at time of discharge; at 6 weeks, the rate was assessed at 36%; at 6 months, 24%. However, five years after the surgery the rate of cognitive decline was 42%. Older age, a lower level of education, a higher preoperative score for cognitive function, and the presence of cognitive decline at discharge were all predictors of cognitive decline at 5 years after CABG. Of these, the most significant predictor was a decline in cognition seen at discharge.

Note that there was no control group, so these results must be treated with caution. Note also that short-term declines in cognitive function are also reported in elderly subjects after non-cardiac surgery, and this can persist in a proportion of these patients - in fact, in 10% after 2 years.

The report was published in the Feb. 8 issue of The New England Journal of Medicine.

20

that practiced specific exercises showed substantial improvement on a variety of driving related tasks compared to those who drove the car, but did not practice the exercises.

The study appears in the April issue of *Neuropsychology*.

http://www.eurekalert.org/pub_releases/2001-04/APA-R1sm-0704101.php

depression

September 2002

A large-scale study of older adults begun in 1989 has revealed that 43% of those with mild cognitive impairment had psychiatric symptoms (such as depression, irritability, loss of interest in activities, or changes in sleep or appetite) in the month before examination. Such symptoms are often shrugged off as emotional reactions to memory decline, but they may be due to changes in brain function, and may respond to treatment.

The report appeared in the September 25 issue of the *Journal of the American Medical Association*.

Full reference

http://www.eurekalert.org/pub_releases/2002-09/wfub-1do092702.php

THIS NEWS ARTICLE FROM 2002—WORTH BRINGING UP W/ DRS

SACRAMENTO, Calif.) — When Jim Sellers could no longer take a shower without chest pain, he summoned his courage and finally called a doctor. The 53-year-old Stockton truck driver learned he needed a triple bypass.

With half a million Americans undergoing coronary bypass surgery each year, the four-decade-old procedure has become routine. But Sellers' operation was not. In the first surgery of its kind at UC Davis Medical Center, Sellers' heart kept beating throughout the procedure, sparing him the ordeal of a heart-lung machine.

Called "beating-heart" or "off-pump" bypass surgery, the technique reduces the trauma of conventional bypass surgery. Patients require fewer hours on a ventilator, spend fewer days in an ICU and face fewer complications, particularly stroke.

And beating-heart bypasses are proving as sturdy and durable as conventional bypasses. Sellers had his triple bypass procedure on a Friday morning, was out of the ICU by Sunday, and back home on Tuesday. When he compares his uneventful recovery to that of friends and relatives, Sellers counts himself fortunate.

"I was pretty lucky," Seller says. "Mine went pretty well." One of the members of the surgical team working on Sellers' heart was J. Nilas Young. Young, who was among the first wave of cardiac surgeons in the United States to master the beating-heart bypass procedure five years ago, has now performed more than 300 of the operations, and has lectured on the technique across the country and in Russia. Today Young does 80 to 90 percent of his coronary bypass procedures without a heart-lung machine.

In conventional bypass surgery, the heart is flooded with cold fluids rich in potassium, an ion that arrests muscle contractions. The patient's blood is then rerouted into a heart-lung machine. There, it is forced over cheesecloth-like membranes of porous plastic, through which oxygen percolates.

The blood is also cooled to about 82 degrees F, then pumped back into the body. Body temperature drops, slowing metabolism and lessening demand for oxygen. After surgery the body must be rewarmed.

Although coronary bypass surgery is over 95 percent successful, there remain serious side effects and occasional deaths — many resulting not from the surgery itself, but from the heart-lung machine.

Patients hooked up to the machine face a two- to four-percent chance of stroke and a 25-percent risk of transitory retinal damage. Post-operative infections may be more of a risk when the machine is used.

And cognitive deficits are common.

Last June Duke University researchers reported in the New England Journal of Medicine that five years after bypass surgery, 42 percent of patients studied still suffered from a decline in intellectual function. The risk was greatest for the patients who were placed on heart-lung machines.

Heart-lung machines provoke the release of a riot of inflammatory molecules capable of harming organs throughout the body, including the brain.

Microscopic bubbles from the oxygenator or arterial plaque dislodged during placement of the tubes connecting patient and machine can block blood flow to the brain or other organs. Mechanical damage to fragile blood cells can result in clots.

Many elderly and very sick patients have been considered ineligible for coronary bypass surgery simply because they are too weak to withstand the rigors of the heart-lung machine.

The beating-heart bypass — likened by some to cutting a gemstone while on horseback — was pioneered in 1965 by a Russian cardiac surgeon, Vassily Ivanovich Kolessov. Although Kolessov achieved good results, the technique was procedure considered too radical and was never adopted by surgeons of the day.

But with the development of new instrumentation in the mid-1990s, the approach was revived. The new instruments stabilize a small area of the heart, allowing a cardiac surgeon to safely place a bypass graft, while the rest of the heart thrashes away normally.

One device looks like a sewing machine foot. Another uses tentacles fitted with a series of suckers that grip the heart muscle with a vacuum seal. More than 45,000 bypass surgeries have been performed worldwide using the latter system alone. Today about 20 percent of cardiac surgeons in the United States have been trained in beating-heart surgery, up from 1 percent just five years ago.

At the annual meeting of the International Society for Minimally Invasive Cardiac Surgery in Atlanta last June, Duke researchers reported on the first 32 patients to receive off-pump surgery at their institution. The off-pump patients spent much less time on a ventilator and in the ICU. The average cost for respiratory care services was \$936 versus \$1,634. Overall ICU costs were \$2,716 versus \$5,009.

Other studies have shown similar cost savings among off-pump patients, along with reduced need for blood transfusion, less respiratory dysfunction, and lower rates of stroke, kidney failure, retinal bleeding, cognitive problems and wound infection.

SEARCH
ADVANCED SEARCH

October 21, 2004

American Heart Association.
Learn and Live.

Looking for Information on Heart Failure? Use the Heart Failure Profiler.

Additionally, visit Circulation's Cardiology Patient Page for more information from AHA on coronary artery disease.

Heart Profilers®
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STEP 4. YOUR RISK FACTOR REPORT

Risk factors are behaviors, conditions, or lifestyle choices that increase a person's risk for developing or worsening coronary artery disease (CAD). Several of these factors can be modified, treated or controlled, and some cannot. Although some risk factors are beyond your control, if you are diagnosed with coronary artery disease, it is especially important to identify and manage the risk factors that can be managed in order to achieve the best possible outcomes, such as a longer and better quality of life.

Risk Factors You Can't Change:Age
Gender
Family History
Ethnicity

▶ LEARN MORE ABOUT RISK FACTORS YOU CAN'T CHANGE

Risk Factors You Do Have That Need To Be Managed:Physical Inactivity
Obesity or Overweight
Lipid Abnormalities
Alcohol

▶ LEARN MORE ABOUT RISK FACTORS YOU DO HAVE

Risk Factors you don't have but need to be aware of:

Smoking
Hypertension
Diabetes

► LEARN MORE ABOUT RISK FACTORS YOU DON'T HAVE

Potential risk factors still being investigated today:

Lipoprotein A - Lp(a)
Homocysteine
C-Reactive Protein (CRP)
Small Dense LDL Cholesterol - Pattern B

► LEARN MORE ABOUT POTENTIAL RISK FACTORS

TOP▲

Risk Factors You Can't Change:

Age

Increasing age is one of the strongest predictors of developing disease of any kind. As we age, the risk of having a heart attack or developing some other kind of heart disease increases. The older a person is, the more likely a heart attack will be fatal. Results of the Framingham Offspring Study, as reported in the American Heart Association 2004 Heart and Stroke Statistics, indicate that the average annual rates of 1st major cardiovascular event rises from 7 per 1000 for men at ages 35 to 44, to 68 per 1000 for men ages 85 to 94. For women, comparable rates are achieved 10 years later in life. This gap closes with advancing age. For the most part, 4/5 people who die of a heart attack are over the age of 65.

7%

Gender

Men are more likely than women to develop manifestations of atherosclerosis such as coronary heart disease and stroke. In addition men tend to have heart attacks earlier in life. The risk for heart attack increases rapidly when a man reaches 45 and climbs steadily as he ages.



Women tend to develop heart disease later in life than men. When women reach the age of 55, their risk of heart disease begins to approach the risk of heart disease for men. Menopause plays a role in the risk for heart disease. Menopause caused by the surgical removal of the ovaries and uterus causes the risk to rise more sharply. Menopause that occurs naturally causes the risk to rise more slowly. Similar to men, as women age, their risk of heart disease and stroke

begins to rise and keeps rising.

Family History

A tendency toward heart disease or atherosclerosis seems to be hereditary. That means children of parents with heart and blood vessel diseases are more likely to develop them. A family history of diabetes, gout, high blood pressure, or high blood cholesterol also increases the risk of heart disease. A family history of high blood pressure, heart disease or stroke increases the risk of stroke. Because you can not change your family history, if you do have a family history that increases your risk, it is even more important to manage any modifiable risk factors you have. Managing your modifiable risk factors can help to reduce the impact of risk factors you can not control.

Ethnicity

For reasons not completely understood, some races have higher rates of heart disease than others. Although socioeconomic factors, such as poor diet, higher stress levels, and lack of access to health care play significant roles in these differences, biologic factors may be involved in certain people. African American women face the highest risk of death from heart disease, and their rate of heart attacks is increasing. Some African Americans with coronary artery disease appear to have a genetic trait that increases the danger of triglycerides, a particular risk factor in women. One study found that African Americans produce less nitric oxide in response to stress; this substance is critical for opening blood vessels and increasing blood flow. Native Americans also face a much higher risk for heart disease than whites. Hispanics have a lower risk for heart disease than both African Americans and Native Americans.

According to the AHA Heart Disease and Stroke Statistics - 2004 Update:

- In the year 2001, cardiovascular disease was present in 30% of male and 23.8% of female non-Hispanic Caucasian adults, in 40.5% of male and 39.6% of female non-Hispanic African American adults, and in 28.8% of male and 28.6% of female Hispanic adults.
- More than 25% of adult Hispanics, Asian/Pacific Islanders, and American Indians/Alaska Natives (of Washington, Oklahoma or Alaska) had a total cholesterol greater than 240 mg/dL.
- More than 60% of adult American Indians and Alaska Natives have at least one of the following risk factors: high blood pressure, current cigarette smoking, high cholesterol, obesity, or diabetes.

TOPA

Risk Factors You Do Have That Need To Be Managed:

Physical Inactivity

Lack of physical activity or an inactive lifestyle increases your risk of heart disease. Physically fit but overweight individuals are reported to have a coronary heart disease risk similar to that of people with no other coronary heart disease risk factors. inactive people are twice as likely to have heart disease as active people. This is because people who are inactive are more likely to have high blood pressure, a tendency to be overweight, higher levels of fat in their blood, and less efficient pumping action of their heart.

The heart is a muscle that needs to be exercised just like any other muscle in your body. With exercise your heart gets stronger and more "fit" and this improves blood circulation to the rest of your body. A heart that is physically fit does not have to work as hard to circulate blood because it pumps blood more efficiently with each heart beat.

Participating in moderate exercise will promote cardiovascular fitness. Jogging, walking, swimming, biking, dancing, and exercise classes are all beneficial. Recommended levels of exercise from the American



Heart Association are 30-60 minutes of activity on most days. The best exercise for improving your heart is aerobic activity that increases blood flow to all your muscles, including your heart.

Benefits of moderate physical activity include:

- Improved weight control - Regular physical activity can help you lose weight or stay at your desirable weight. Maintaining your desirable weight helps lower your risk of heart disease and diabetes.
- Decreased blood pressure - The higher your blood pressure, the greater your risk of developing heart disease or stroke. Regular physical activity can help reduce high blood pressure in some people. Physical activity may also help prevent high blood pressure.
- Improved lipid profile - Regular moderate-to-vigorous physical activity helps to increase high density lipoprotein (HDL or "good") cholesterol levels. High levels of HDL are linked with a lower risk of coronary artery disease.
- Decreased risk of diabetes - By helping with weight management, exercise helps reduce the risk of developing diabetes. For people who have diabetes, exercise helps to decrease their need for insulin.
- Decreased risk of coronary heart disease - regular physical activity (even mild to moderate exercise) can help reduce your risk of heart disease.
- Decreased the risk of osteoporosis.
- Decreased the risk of colon cancer.
- Improved mental health.

Choosing to exercise will improve your health and how you feel about yourself. The key to a successful program is choosing an activity (or activities) that you will enjoy. Even moderate levels of activity have important health benefits. By choosing activities you like, you will be more likely to keep doing them regularly and enjoying the many benefits of physical activity.

Regular low to moderate exercise helps to improve overall health and helps reduce the symptoms of heart disease. Before you start or increase your exercise program, you should discuss it with your primary care provider or cardiologist, especially if you are not used to exercising. It is important to begin and advance your exercise regimen slowly. Starting with strenuous exercise should be avoided. Working your way up to 30 to 60 minutes of exercise on most days is recommended for most people.

Some tips for generally increasing your activity level include: park farther away, take the stairs instead of the elevator or escalator, and walk instead of drive to nearby destinations. For more information contact your local American Heart Association or call 1-800-AHA-USA1 (1-800-242-8721) or the National Heart, Lung, and Blood Institute, Education Programs Information Center, P. O. Box 30105, Bethesda, Maryland 20824-0105.

You can also visit:

American Heart Association,

Just Move at <http://www.justmove.org>, or

National Heart, Lung, and Blood Institute at <http://www.nhlbi.nih.gov>

Obesity or Overweight

Overweight and obesity are conditions in which there is too much body fat. They are caused by eating more calories than you use in physical activity and daily life. If you have too much fat - especially in your waist area - you are at higher risk for health problems. The presence of abdominal obesity is highly correlated with an increased risk of heart disease. A waist measurement of 40 inches (102cm) or greater in a man or 35 inches (88cm) or greater in a woman is considered to represent abdominal obesity. Abdominal obesity is one of the 5 criteria used to diagnose the metabolic syndrome.



Body mass index (BMI) is also an accurate way to determine when extra pounds translate into health risks. The measure takes into account a person's weight and height to gauge total body fat. Overweight is defined as a body mass index of 25 or more. A BMI of 30 and higher is considered obese. The higher the BMI, the greater the risk of

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Additional Material from Judith via E-mail.

Possible side effects for Coronary Artery Bypass Surgery

Bleeding - In order to perform a CABG, the skin, the sternum (breast bone) and the sac surrounding the heart (pericardium) must be cut open. This may cause bleeding. Additionally, on rare occasions, the place on the heart where the new graft has been sewn comes loose, causing bleeding into the pericardium. If it is suspected that your graft has torn loose, you will have to return to the operating room for repair. If there is unexpected or excessive bleeding during surgery, your doctor may want to give you supplemental blood to re-establish normal blood volume.

Some medicines such as aspirin and ibuprofen as well as the anticoagulant coumadin, can interfere with the body's normal ability to clot blood. Before a CABG, your doctor will need to know if you are using these medicines and will tell you to stop taking them before the procedure.

Discuss with your doctor:

How often does the graft come loose from the heart?

Where does the blood go that leaks from the hole in the heart?

What are the risks of blood transfusions?

Hypotension During CABG - Low blood pressure may occur during coronary bypass surgery. Blood pressure is monitored continuously during the surgery. Should your blood pressure fall, your doctor may change your position on the table, administer fluids, or administer medicines to help bring your blood pressure back to a normal range. If you feel lightheaded, weak, dizzy or like you are going to pass out after the surgery, please tell the staff immediately. Low blood pressure is a concern because adequate blood pressure is needed to supply your brain with oxygen and nutrients. Low blood pressure for a long period of time can lead to a stroke.

Discuss with your doctor:

How often does this occur as a result of this surgery?

If this happens during surgery, how will it be treated?

Hypertension - Hypertension (high blood pressure) may occur during and following CABG surgery. Blood pressure is monitored continuously during and after the procedure. High blood pressure can lead to stroke and kidney damage. If you experience hypertension, your doctor may administer medicines to lower your blood pressure to a normal level.

Discuss with your doctor:

Should I continue to take my blood pressure medicine before my surgery? After my surgery?

How often does high blood pressure occur during or after the surgery? What is my risk for this problem?

Arrhythmias After CABG - Arrhythmias are abnormal heart rhythms. They can cause the heart to pump less effectively. Under some

conditions, such as during or following CABG surgery, almost any part of the heart can start a heartbeat. In other words, the pacemaker function of the heart may be taken over by an unusual location. This unusual location does not promote the normal rhythm of the heart, therefore, an arrhythmia results. Atrial fibrillation is the most common arrhythmia following CABG. During and following the surgery, your vital signs and EKG are constantly monitored, so, if arrhythmias arise, treatment can be given immediately. Most arrhythmias related to CABG resolve with appropriate treatment.

Discuss with your doctor:

What are the symptoms of arrhythmia?

What are treatments for arrhythmia?

What is my risk for development of an arrhythmia during or after surgery? How serious would this problem be?

Embolism or Stroke - An embolus is a particle that travels through the bloodstream until it becomes stuck in a blood vessel, preventing blood flow to the tissue beyond the particle. The plural of embolus is emboli. If an embolus blocks an artery to the heart, it can cause a heart attack. If it lodges in an artery to the brain, it can cause a stroke.

Aside from an embolism, other causes of stroke include the bursting of a blood vessel that supplies the brain or a significant decrease in blood pressure. The nerve cells within the brain are heavily dependent on an adequate supply of oxygen and nutrients. If that supply becomes critically reduced, regardless of cause, the nerve cells die within minutes. When nerve cells cannot function, the part of the body controlled by these cells cannot function either. The devastating effects of stroke are often permanent because dead brain cells are not replaced. The medical term for stroke is cerebrovascular accident (CVA).

Discuss with your doctor:

What can I do to prevent an embolism from occurring?

What parts of this procedure can cause emboli?

Is there anything I can do to prevent having a stroke?

What steps will be taken to decrease the chance that I will have a stroke?

Is there a test that can predict if I am going to have a stroke?

Kidney Damage - The kidneys are two organs that serve as filters to control the levels of normal chemicals in the blood as well as to get rid of waste in the form of urine. The kidneys need a large supply of blood to function normally. When a patient has a percutaneous coronary intervention (PCI) or bypass surgery (CABG) and develops hypotension or bleeding, the blood flow to the kidney can be decreased, making it difficult for the kidneys to filter normally.

If renal dysfunction occurs, you will retain fluid and waste products. Your doctor may prescribe diuretics or fluids to help the blood flow to your kidneys. In severe cases an external machine may be required to filter the waste products and excess fluid out of the blood (dialysis).

Discuss with your doctor:

If I get kidney damage, will I have to get dialysis?

What are the symptoms of waste and fluid retention?

Cardiac Tamponade - Cardiac tamponade is the result of accumulation of blood in the sac that surrounds the heart. Following CABG, a chest tube (drainage tube) will be placed temporarily in the sac to facilitate drainage of blood from the surgery site. On occasion, a clot develops and obstructs the tube, causing the blood to accumulate around the heart, putting pressure on the outside of the heart. With this additional pressure, the heart is not able to contract normally and blood pressure falls. If tamponade occurs, you may have to return to the operating room for clot removal if this cannot be accomplished at the bedside.

Discuss with your doctor:

How frequently does cardiac tamponade occur?

How serious is the development of tamponade?

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How often does high blood pressure occur during or after the surgery? What is my risk for this problem?

Post-Operative Pain - As with any surgical procedure, you will experience pain following your surgery. Most patients report that the pain in the leg (if a saphenous vein was used) is more uncomfortable than their sternal incision. Your nurse will have pain medicine for you to take.

Discuss with your doctor:

What kind of pain medicine will I need and when will it be given to me after surgery?

How often can I have pain medicine?

What should I do if the pain medicine does not work?

Infection - Any time the skin is broken, as will be done when the incisions are made for surgery, there is a chance that the site of incision or tissue underneath will become infected. Signs of infection include tenderness, redness, swelling, and drainage at the site. If you notice any of these following your procedure, you should notify your doctor.

Discuss with your doctor:

Will you use antibiotics to prevent me from getting an infection?

Will we know immediately if I have gotten an infection?

If I get an infection, will I have to stay in the hospital longer?

Respiratory Problems - In order to have this surgery, you must receive anesthesia. One of the side effects from the surgery is that your lungs may develop small area of collapse (atelectasis) or infection (pneumonia). Following any surgery, your surgical pain may make it difficult to take good deep breaths. Both of these situations increase the chance that you will have respiratory problems. Your nurse will have you do breathing exercise following surgery to keep your lungs open.

Pulmonary embolism (blood clot in the lung) is a post-operative complication that can occur after any type of surgery, including cardiac surgery. Blood clots form in the venous system, usually from stasis (when blood stands still), and are sent through the right side of the heart into the lungs, causing acute respiratory problems. You will be observed very closely for any respiratory problems post-operatively.

Discuss with your doctor:

Other than the breathing exercise, what can I do to prevent atelectasis?

Will I need to be on oxygen or on a ventilator?

Post-Pump Syndrome - This is a whole-body inflammatory response to the use of the cardiopulmonary bypass pump. The generalized inflammation can cause swelling and fluid accumulation (edema) throughout the body and interfere with the function of internal organs including the lungs, kidneys and brain. Similar reactions can also occur following variations of the CABG that do not involve use of the bypass pump but are more mild. Several different medications can help reduce the risk of post-pump syndrome.

Discuss with your doctor:

How can the risks of post-pump syndrome be reduced?

What is my risk of developing post-pump syndrome?

If I develop post-pump syndrome, what can be done to treat it and how long does it take to

resolve?

Mental Status Changes - There is some risk of experiencing changes in mental status following a CABG. The changes may be distinct changes that can represent abnormal function of a specific location in the brain, such as occurs with a stroke, or more generalized changes, such as confusion or memory loss. Some of these changes will resolve on their own, while others may cause permanent alterations of mental function. Risk factors for mental status changes include hardening of the great artery (atherosclerosis of the aorta), increasing age, a history of neurologic disease, lung disease, a history of excessive alcohol intake, previous CABG, arrhythmias, hypertension, or hypotension associated with the procedure.

Discuss with your doctor:

How often do your patients experience mental status changes following a CABG?

What is my risk of having a mental status change following this procedure?

What can be done to lower my risk of mental status changes following CABG?

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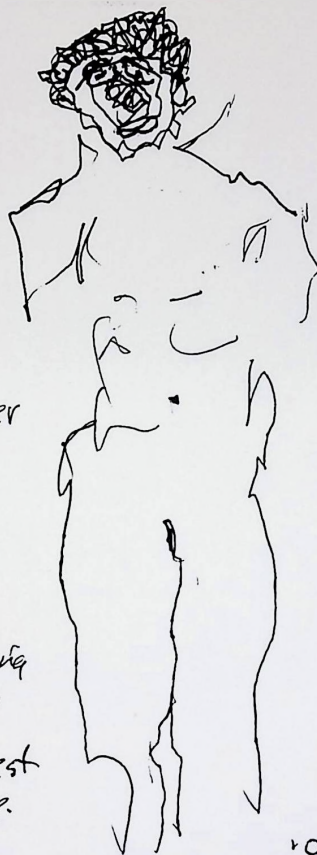
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