

V-AWARE

VASCULAR HEALTH EDUCATION FOR ALL

MyVascularHealth.org



Peripheral Artery Disease

Hypertension

Diabetes

Cholesterol

Smoking

Genetics

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A PATIENT'S STORY

The Eastern Vascular Society (EVS) was founded in 1987 to enhance the ability to provide vascular care and serve disparate communities through a commitment to diversity and inclusion and to promote diversity and inclusion within the Society, in vascular surgery education, training and research.

Our objectives are to:

- Advance the art and science of vascular surgery.
- Provide an educational forum for physicians.
- Improve the delivery of vascular healthcare to the public.
- Promote research for vascular disease.

EasternVascular.org

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Center for
VASCULAR AWARENESS
(not-for-profit organization)



V-Healthy[®]

Just imagine the impact of empowering young high school students to become the *Sherlock Holmes* of vascular health and disease. What if vascular specialists lead the way in creating an outreach program that empowered these young students to diagnose vascular disease and its risks in their parents, grandparents, and relatives? What if we then were able to connect the dots showing how implications of the genetic and environmental risks they are exposed to today can affect their vascular health decades later?

V-Healthy[®] is designed to be a grassroots vascular education, awareness, and prevention campaign enabling vascular specialists & health care providers to champion vascular health education and awareness in their communities.

V-Healthy[®] Day – March 27, 2019

- Over 20 participating high schools in the Capital Region of Upstate New York.
- Over 10,000 students and parents impacted.
- In 2018, students diagnosed hypertension in more than 50% of their parents.
- Raised \$50,000 for student scholarship awards.

Educators Needed: Physicians, All Allied Health Professionals
Nursing, NP, PA, & Medical Students

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E-mail: info@MyVascularHealth.org

Welcome to V-Aware, a publication sponsored by the **Eastern Vascular Society** designed to promote vascular disease awareness in our community. Each issue will focus on a specific vascular disease process exploring the cause, natural history, treatment options and patient stories in order to increase physician and patient understanding of vascular disease. The articles are authored and reviewed by multiple vascular specialists including those in your community. We are including some of these local experts in your community with each of the articles in case you have any more questions or would like additional information regarding the subject material. We hope *V-Aware* increases your understanding of vascular disease. Your comments would be appreciated regarding this issue and topics for future issues. Feel free to write to us at info@vaware.org.

Letter from the Chief Medical Editor

Understanding the Complexity of PAD

If you or anyone you know has high blood pressure, diabetes, high cholesterol, or heart disease, or if they smoke cigarettes or have a family history of cardiac disease or stroke, then chances are that peripheral artery disease (PAD) already has or will touch your life.

PAD is a manifestation of systemic atherosclerosis, also known as “hardening of the arteries,” and can affect any of the arteries supplying blood to organs and extremities in the body. As we age, cholesterol, fat, and calcium builds up in the artery walls, forming plaques that can rupture and block blood flow. When blockage occurs in the coronary arteries it can lead to a heart attack, when it occurs in the carotid arteries supplying the brain it can cause a stroke, and when it affects the arteries supplying the extremities it can lead to leg cramps, sores, gangrene, and even amputation.

PAD is difficult to diagnose by symptoms alone, and only 25% of patients with PAD are recognized and undergo treatment. A recent PARTNERS study conducted across 25 U.S. cities and 350 primary care practices evaluating nearly 7,000 patients with PAD, found that a health history and physical examination missed 85% to 90% of patients with PAD.

The researchers discovered that simple noninvasive tests such as measuring the ankle-brachial index are necessary for detecting PAD. For these reasons, we find a candid discussion on PAD to be vital for our patients’ health.



Warmest regards,

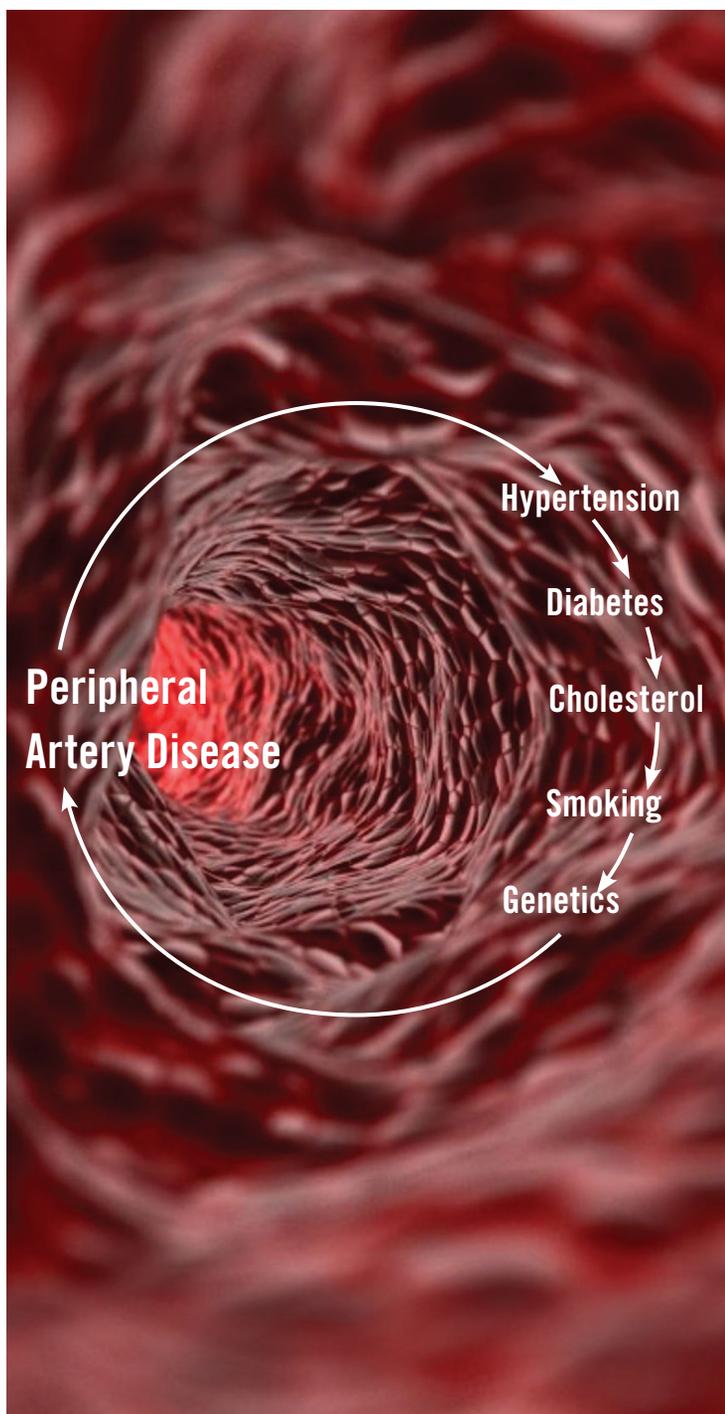


Manish Mehta, MD, MPH

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President & CEO, Center for Vascular Awareness
Founder & Director, Albany Vascular International Academy

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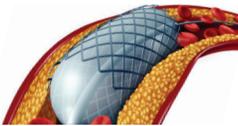
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TACKLING ATHEROSCLEROSIS Head On



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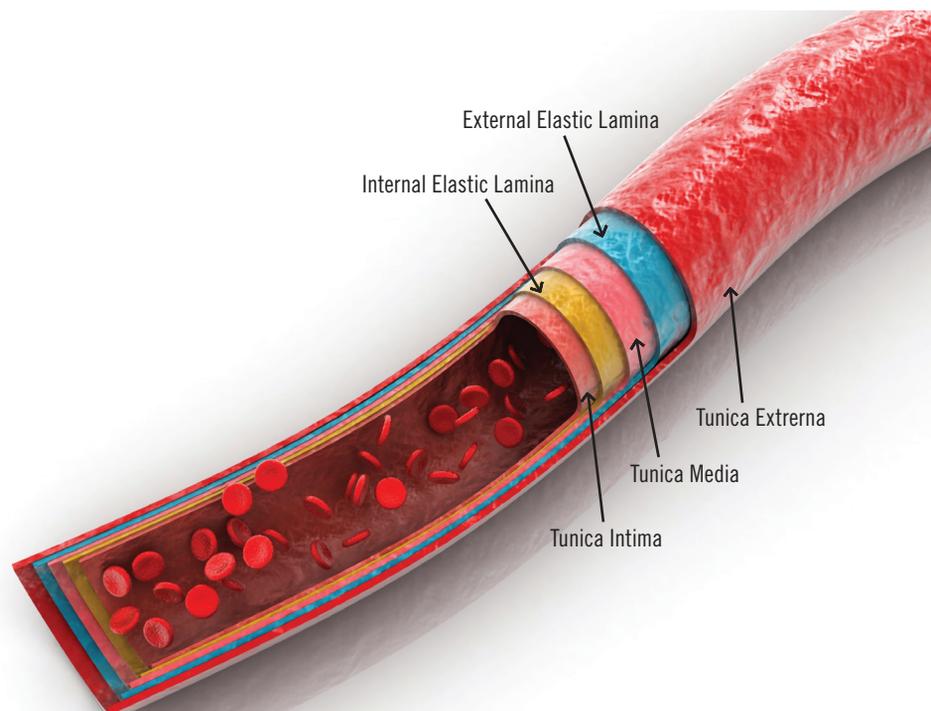
The Greek word, *athera*, translates to “a lump of gruel.” *Sclerosis* means “to harden.” When the terms are combined, they convey an accurate picture of atherosclerosis: hardened “gruel” deposited in artery walls.

Coronary artery disease (CAD), peripheral vascular disease (PVD), and cerebrovascular disease are simply different terms for the same problem: atherosclerosis of a particular arterial bed within the body.

THE PROCESS

Inflammation is the body’s method of coping with insult or injury. Virtually every disease process that can affect a human being may be defined by the inflammatory response that has been evoked and the consequences of that response. The body’s intention is to heal the site where the injury has occurred. Inflammation, however, is incredibly powerful, and unleashing it most often leads to adverse consequences. Atherosclerosis is the end result of the body trying to heal an injured artery.

Your arteries are not inert conduits that permit blood to flow from your heart to the capillaries and then to your veins—they are living body parts. Arteries are three layers thick, and the process of atherosclerosis begins at the intima, the innermost layer of the artery that is in contact with the blood flowing through it. The most critical part of the intimal layer of an artery is the endothelial cell. The atherosclerotic process begins when these cells are injured or if their function is





impaired. Endothelial cells are responsible for maintaining the health and normal function of an artery. Endothelial cells also maintain the normal structural integrity of the artery by regulating the chemistry around them. The layer of endothelial cells is like a Teflon shield that prevents the elements within the blood and within the vessel wall itself from interacting, normally preventing the inflammatory response that culminates in atherosclerosis.

If the endothelial layer of the artery can be thought of as Teflon, the layer immediately beneath it (referred to as the *subendothelial region*) can be compared to felt fabric. If the sub-endothelium becomes exposed to blood elements, the process of inflammation commences as the cells and blood elements behave like sticky Velcro balls attaching to felt.

The final players in this analogy are the cells living in the neighborhood of the endothelium called *monocytes*, *macrophages*, and *fibroblasts*. They are the members of the “inflammatory band,” and they are eager to play—very loudly. The endothelium keeps them chemically in a harmonic balance, unless injury occurs.

INJURY AND INFLAMMATION

Injury to and inflammation of an artery can come from many directions: for example, eating a poor diet that is high in fats and carbohydrates; or having high cholesterol, unrecognized or poorly controlled hypertension, or diabetes. In many patients, a combination of factors adds up over decades of endothelial maltreatment leading to

atherosclerosis. Your genes surely play a large role in developing atherosclerosis, but it’s what interacts with your genes (or what doesn’t) that often controls the extent of the effects that atherosclerosis will have in your body.

It bears emphasizing that the greatest controllable evil to the endothelium is smoking! The consequences of cigarette use can be best compared to the act of taking a razor blade and running it directly over the endothelium. Not only do the chemicals that reach the artery from cigarette use scrape off the endothelium, they also make the platelets in your blood more active and likely to congeal at places of injury.

Atherosclerotic plaques can be soft (meaning that they are rich in fats and inflammatory cells) or hard (meaning that they are scarred and full of fibrous tissue). Softer plaques are “younger” generally and very dangerous; if a soft plaque breaks, it can often lead to a vessel abruptly clotting off when the platelets they attract all show up in a hurry. Such plaques have been present for a long time, but not long enough for scar tissue to be deposited. Rupture of such a plaque is often the cause of heart attacks in relatively younger patients.

Hard plaques are “older.” To become hard requires a more prolonged period of inflammation, which encourages the body’s scab-forming cells (the *fibroblasts*) to lay down a microscopic scab. Such plaques are usually observed in middle-

aged and older patients who may have atherosclerosis in any portion of their body.

SMOKING CESSATION

While some people are able to smoke, and never seem to develop vascular problems, most people who smoke will develop vascular injury and diseases. Continuing to smoke significantly increases the risk of a bad outcome. Based on current rates of use, cigarettes will cause 1 billion deaths in the 21st century. There is no defense for cigarette use. There are no physical benefits to cigarette use. **Quit! Quit yesterday!** Do whatever it takes. Use available aids, prescriptions you can obtain, and whatever other support you can get, such as the New York State Smoker’s Quit Line. Talk to your doctors about your desire to quit. If you’re living with a significant other or spouse who smokes, know that quitting together has been clearly shown to heighten success rates for both parties. Second hand smoke will also harm you if you have vascular problems. Identify smoking for what it is for you. For some people, smoking is primarily a nicotine addiction. For all smokers, it is a behavior that has become ingrained. Try identifying your rituals (for example, making a phone call and lighting up, etc.) and alter the pattern of how you do things. Change your routine. For some, quitting is very hard. For all, quitting is the nicest thing you can do



for your endothelial health. Smoking is something you can control 100%. If you have vascular disease, and continue to smoke, your chance of losing a leg, having a heart attack or a stroke are much higher than if you quit smoking, even if you have smoked for your entire life.

KNOW YOUR RISK

Patients who never see a health care provider are doing themselves a disservice when it comes to detecting atherosclerosis. Measuring blood pressure, lipid profiles, and fasting blood sugar is easy and reveals much. Most of the traditional risk factors we associate with CAD come from data obtained in the middle of the 20th century from the residents of Framingham, MA. A project was started by the Harvard School of Public Health to assess the habits of a large number of people from that New England town. Generations have been followed, and these population data are the basis for our advice today regarding atherosclerosis prevention. If you search the Internet for “Framingham Risk Calculator,” you will find a tool that can calculate your 10-year cardiovascular disease risk.

DIET AND ACTIVITY

The North American/European diet most of us have been raised on is inflammatory to the arterial endothelium and interacts with our genetics to promote the development of hypertension (high blood pressure), diabetes, and hyperlipidemia (high cholesterol). You may be among the many people who have interpreted the word “diet” as an acronym for “*do interventional eating temporarily*.” A proper diet is a permanent lifestyle choice based on individual needs and knowledge of your family history and your own medical condition(s). There are no miracle diets, and continuing to pursue one is simply a waste of time and energy. The fad diets that abound may lead to rapid and unhealthy weight loss and are often followed by rebound weight gain when one returns to one’s old habits. The best suggestion is to eat a healthy diet

rich in fiber and minerals and low in trans-fatty acid. Protein is important and should be lean. The American Diabetes Association and American Heart Association have excellent web-based resources for patients and also publish cookbooks that many people find helpful.

Along with the obesity epidemic in the United States, there is also an epidemic of physical inactivity. The current recommendations from the American Heart Association and the Centers for Disease Control and Prevention call for at least 150 minutes per week of moderate intensity activity such as walking at a brisk pace. The Centers for Disease Control and Prevention also recommend strength training of all major muscle groups twice weekly. Again, their websites are very helpful (www.cdc.gov and www.aha.org). Eating healthy foods and remaining active will minimize the chances of developing atherosclerosis, hypertension, hyperlipidemia, and adult-onset diabetes.

HYPERTENSION AND HYPERLIPIDEMIA

The shearing effects of high blood pressure on the arterial endothelium promote atherosclerosis. Patients diagnosed with hypertension, defined as a systolic blood pressure of 140 mm Hg or more or, a diastolic blood pressure of 90 mm Hg or more, should be treated with diet and exercise in the absence of other conditions, most notably diabetes. In patients with diabetes, hypertension needs immediate medical treatment. For individuals with hypertension that persists despite lifestyle changes, medical therapy with a single medicine or combination of drugs is suggested. An optimal blood pressure is 120/80 mm Hg or less. In patients without diabetes, the target is a reliable pressure of 130/80 mm Hg or less. In patients who have diabetes, the goal is 120/80 or less. Even small increases in blood pressure can cause damage over time.

Hyperlipidemia is also a major risk factor for the development of atherosclerosis, and all adults should know their lipid profiles. Diet and exercise are first-line therapy for

elevated cholesterol unless a patient has diabetes or multiple other risk factors for CAD. The current optimal total serum cholesterol level in a patient without diabetes or evidence of atherosclerosis, is 200 milligrams per deciliter (mg/dL) of blood. The National Heart, Lung, and Blood Institute launched the National Cholesterol Education Program (NCEP) in 1985 (now in its third revision referred to as the *NCEP III*). There are subgroups of patients who should receive medical therapy for hyperlipidemia including individuals with diabetes and chronic kidney disease or PVD. The preferred treatments are members of the drug family known as *statins*. The goal in these patients is a low-density lipoprotein of less than 100 mg/dL. The use of statins has been shown to help lower the cholesterol levels, and control some of the inflammation within the atherosclerotic plaque and its potential complications.

DIABETES

For several years now, diabetes has no longer been considered a risk factor for CAD. Diabetes is a disease state, and CAD is presumed to be present; it is the leading cause of death in diabetic patients. The guidelines for the management of hypertension and hyperlipidemia in patients with diabetes are identical to those for managing patients with known heart disease. Diabetes frequently occurs in the setting of hypertension. In a patient with diabetes, hyperlipidemia is presumed to exist, and drug therapy is suggested regardless of the patient's actual cholesterol values at baseline. Controlling diabetes makes controlling hypertension and hyperlipidemia easier. Although intuitive, science has not shown that tightly controlling diabetes prevents CAD and PVD complications. Science has shown that controlling diabetes is most beneficial in small vessels, such as those of the kidneys and retina. If you have a family history of diabetes or if you are overweight, you should speak to your medical doctor and be evaluated for diabetes.

ALCOHOL INTAKE

There is very clear evidence that moderate alcohol use of any type (defined as two drinks per day for men and one per day for women) is associated with a reduction in death from CAD. This situation is a slippery slope because some patients should not drink for social reasons, and others have medical problems that will be potentially worsened by alcohol intake. The latter can be true of patients with hypertension, hyperlipidemia, and diabetes. As long as a person has no medical or addiction-related reasons or personal reasons to avoid alcohol, moderate use may help to reduce atherosclerosis.

HOW TO SCREEN

In a new house, when one turns on the faucet, the water pressure is normal. After a certain number of years, however, no home has normal pipes. The same concept applies to the heart and other blood vessels. When a patient has a stress test that is normal, it implies that the blood flow to the heart can be increased to meet the extra demand. In no way does this mean

the arteries are normal. It does mean that if CAD is present, it is neither severe or flow limiting, and that is a good thing.

Calcium scoring (CS) can give an estimate of how extensive a patient's arterial disease burden is and has been scientifically shown to be superior to any blood test currently touted to detect CAD. The test is based on the observation that where inflammation is extensive, the body tends to deposit calcium. This process is the hardening of the artery. A score of 0 is optimal, a score of 10 to 100 confers low risk, 101 to 400 indicates moderate risk, and patients with scores of more than 400 have extensive disease burden and are considered at high risk for major cardiac events. A patient with an excellent stress test result and a CS of 0 is very different from a patient with an excellent stress test result and a moderate or high risk CS.

PROTECT YOUR ARTERIES

Heart and vascular disease remain the leading causes of death in adults, and most of those deaths are due to atherosclerosis. The inflammation that occurs is a response to injuring the most important cell of the arterial wall, the endothelial cell. The healing response to such an injury ultimately leads to changes in the vessel wall that can trigger acute events such as sudden heart attack and death or more delayed events such as PAD and stroke. You cannot control everything about this process, such as your age, gender and genetic history. Indeed, there is clearly a genetic predisposition in some patients to develop atherosclerosis. You can, however, control many things that interact with your genetic makeup, (e.g. smoking cessation, proper diet and exercise, and treating medical conditions you are aware of via routine medical care). If you view your arteries as being a vital body part, you can try to protect them from inflammatory injury by treating them well in the ways previously suggested. Then you will be well on your way to tackling atherosclerosis head on. 🏆

Ask Your Doctor

1. What are my blood pressure, lipid profiles, and fasting blood sugar levels?
2. Do I have any medical problems that will be made worse by alcohol?
3. Should I have a calcium scoring test?

DIAGNOSIS AND TREATMENT OPTIONS

for PAD



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Peripheral artery disease (PAD) occurs when the arteries in the legs become narrowed or clogged with fatty material called *plaque* (a mixture of fat, cholesterol, and other substances).

The buildup of plaque causes the arteries to harden and narrow, a process called *atherosclerosis*. When leg arteries stiffen and clog, blood flow to the legs and feet is reduced. Some people call this “poor circulation,” but that description only tells part of the story.

RISK FACTORS

The main risk factors for PAD are a sedentary lifestyle, smoking, diabetes, high cholesterol, high blood pressure, or a family history of heart disease or stroke. PAD becomes more common after age 40 and is one of the most serious clinical problems our health system faces as the population ages. PAD affects 5% to 10% of patients between 55 and 65 years of age and can affect as much as 20% of the population over 65. Unfortunately, only 25% of people with PAD are ever diagnosed and receive treatment, most likely because the classic symptoms of PAD are detected in only 10% to 15% of patients.

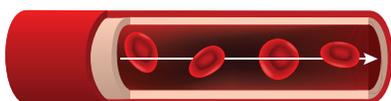
PAD is often ignored, as many people think their aches or pains are simply related to aging or arthritis; however, this serious disease can dramatically

shorten life expectancy. Once atherosclerosis has progressed, several problems can occur: Plaque rupture can cause acute blockage of the artery, or arteries can become progressively narrowed by plaque until they are completely blocked. In either scenario, plaque that affects arteries in the heart can cause heart attack, plaque in arteries supplying the brain can lead to stroke, and plaque in arteries supplying the extremities can lead to critically decreased blood flow and disabling PAD.

For PAD sufferers, the risk of having a heart attack can be **six times higher than normal**, whether or not leg symptoms are present.

The 5-year mortality rate for someone with untreated PAD is higher than that of **patients with metastatic colon or breast cancer**.

Stages of Atherosclerosis:



Healthy Artery



Plaque Formation



Thrombosis Formation

SYMPTOMS

Initially, as plaque builds up in the arteries that supply blood to the legs, it causes pain in the muscles during walking or exercise that goes away with rest; this is called *intermittent claudication*. This disorder results from an imbalance in the supply and demand of blood flow that is insufficient for regular muscle activity. The severity of PAD depends on how early it is detected and any pre-existing health factors, especially smoking, high cholesterol, heart disease, or diabetes. In later stages, leg circulation may be so poor that pain occurs even during periods of inactivity or at night (rest pain). This rest pain usually worsens when the legs are elevated and is often relieved by lowering the legs, due to the effects of gravity on blood flow. Typical patients suffering from rest pain may dangle their legs off the side of the bed in order to sleep. In severe cases, PAD can lead to tissue death (gangrene), which may result in the need for amputation.

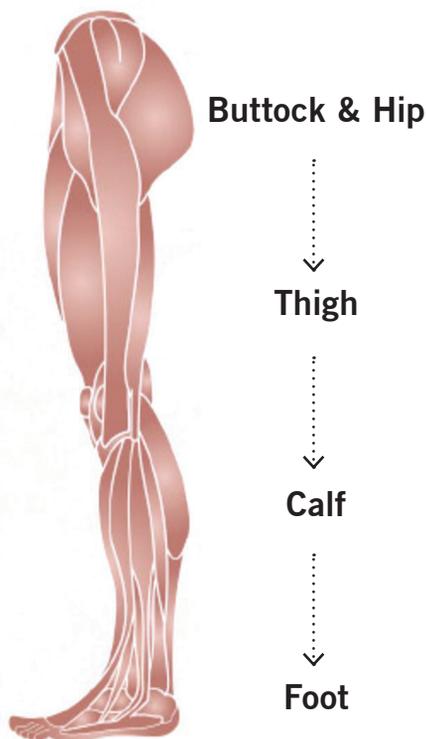
Other signs of PAD include cramping in the thighs or calves, loss of pulses in the feet or toes, and poor toenail or leg hair growth. Patients with compromised blood flow to the extremities as a consequence of PAD may present with typical ischemic pain in one or more muscle groups, atypical pain, or no symptoms at all.

DIAGNOSIS

If you think you have PAD, see your healthcare provider. You should talk about any symptoms you are having and review your medical history and risk factors. Your provider will examine the pulses in your feet and legs and may ask you to undergo tests called an *ankle-brachial index* (ABI) and *pulse volume recordings* (PVR). These noninvasive tests compare the blood pressure in your ankles with the blood pressure in your arms and use sound waves to check for reduced blood flow in the arteries.

PAD can also be diagnosed by other tests that measure blood pressures in the leg (segmental pressure), blood pressures

Affected Muscle Groups:



Patients with compromised blood flow to the extremities as a consequence of PAD may present with typical ischemic pain in one or more muscle groups, atypical pain, or no symptoms at all.

in the toes (*toe-brachial index* or TBI), and artery blood flow (ultrasound).

In patients with disabling intermittent claudication or limb-threatening ischemia who decide to undergo a procedure to improve leg blood flow, a road map of the arteries is usually obtained in order to guide the intervention. This can be done with an arterial ultrasound, CT angiography, magnetic resonance arteriogram, or ideally with x-rays and injected contrast (angiogram or arteriogram). These studies allow the doctor to identify the arteries that are affected and to determine what form of intervention would be useful.

LIFESTYLE AND MEDICATION

Treatment can take the form of lifestyle changes, medicines, and endovascular or surgical procedures, if needed. Because individuals with PAD are at high risk for heart attacks and stroke, they must take charge of controlling their risk factors related to cardiovascular disease. There are a number of life-saving steps that you can take right away to help prevent and control PAD.

- Get help to quit smoking, and set a quit date now.
- Control your blood pressure.
- Lower your cholesterol.
- Control your blood sugar.
- Practice proper foot care, especially if you have diabetes.
- Follow a healthy eating plan.
- Exercise regularly.

You can also talk to your doctor about medication therapy with drugs such as aspirin, clopidogrel, or cilostazol as a first-line of treatment for PAD.

CHOOSE TREATMENT

Today, patients with PAD have many choices ranging from medical treatment, minimally invasive endovascular therapies such as angioplasty or stenting, and surgical repair. These topics are covered in depth in other articles in this issue of *V-Aware*.

Regardless of the specific approach the physician and patient ultimately decide to carry out, it is important to remember that PAD is treatable. If you experience symptoms of pain or aching in your legs or feet, talk to your doctor and be open to a combination of lifestyle changes and medical help to improve your vascular health. 🌈

Ask Your Doctor

1. Am I at increased risk for PAD?
2. How can I tell if pain in my foot or leg is not a sign of PAD?

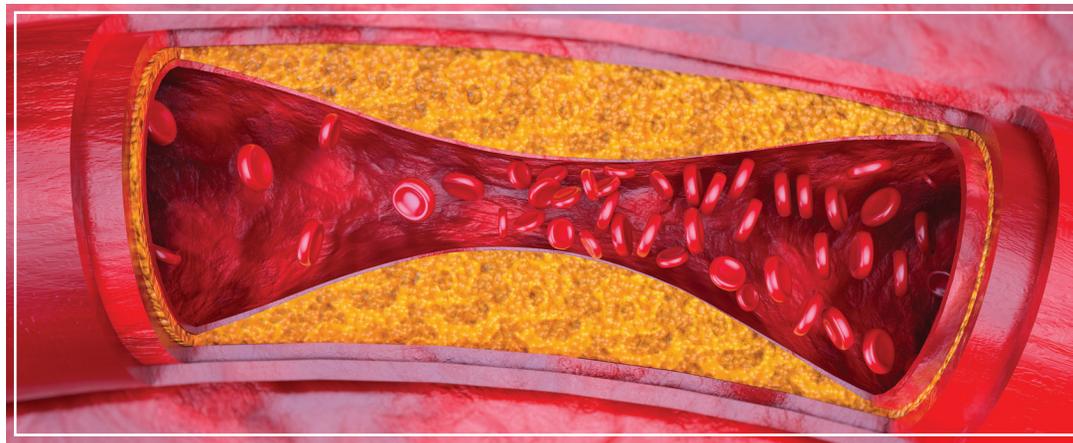
MINIMALLY INVASIVE ENDOVASCULAR TREATMENTS for PAD



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By now, if you have read a few articles in this issue, you should be well informed about the risk factors, diagnosis, and medical treatment of peripheral artery disease (PAD).



Plaque narrows an artery blocking the flow of blood.

PAD results from atherosclerosis or “hardening of the arteries” and is a life- and limb-threatening condition. Hardening of the arteries can lead to decreased blood flow and, if undiagnosed and untreated, can lead to tissue and nerve damage.

There is a range of PAD severity. A patient may have no obvious symptoms at all, suffer from intermittent claudication (leg or calf pain when walking a certain distance that is relieved with rest), or experience chronic limb ischemia (CLI) (which presents as foot pain at rest, nonhealing sores or ulcers, and gangrene). Early diagnosis and treatment can often prevent PAD from worsening and can also reduce the associated risks of heart disease and stroke.

ENDOVASCULAR APPROACHES

Over the past decade, minimally invasive, endovascular treatment options for PAD have revolutionized vascular specialists’ ability to treat patients with disabling symptoms of intermittent claudication or chronic limb-threatening ischemia. These so-called percutaneous options do not require a large surgical incision and are conducted through a narrow catheter that is threaded through a small opening in an artery, usually in the groin.

When deciding the type of therapy to use, whether it is minimally invasive or surgical, vascular specialists make decisions based on patients’ symptoms, location of arterial blockages, expertise in performing the endovascular and surgical procedures, and the risks and

benefits of these procedures to the patients. Minimally invasive percutaneous endovascular therapy for PAD is performed under local anesthesia and sedation. The various techniques that can be performed with an endovascular approach include:

1. Balloon angioplasty (standard balloons or drug-coated balloons)
2. Bare metal and covered stent placement
3. Atherectomy (plaque excision and removal like 'Roto-Rooter')

Regardless of the technique, the endovascular approach is generally considered to be less invasive, has a lower complication rate, can be performed as an outpatient procedure, requires infrequent hospitalization, and is associated with a quicker recovery when compared to surgery. The benefits of minimally invasive endovascular therapies also come with a price tag, however, in that they are often associated with higher failure rates when compared to surgical bypass.

Balloon angioplasty

In balloon angioplasty, a catheter with a low profile balloon tip is inserted into narrowed or blocked blood vessels and inflated. This technique can break the plaque and widen the blood vessel diameter, re-establishing circulation to the affected area.

There are many types of balloon angioplasty catheters. Standard balloons apply significant force from within the artery to rupture the plaque. Drug-coated balloons have additional anti-proliferative medication that coats the balloons and is delivered as the balloon is inflated in the artery.

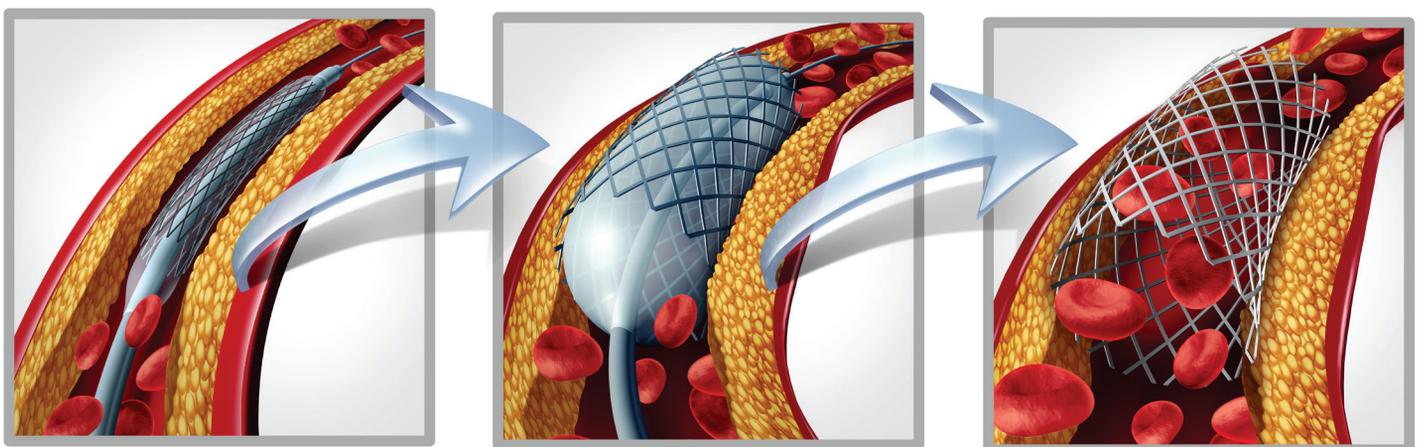
The outcome of balloon angioplasty is more favorable for short and focal arterial blockages and less favorable for diffuse arterial disease that presents with longer areas of arterial blockages. In diffuse cases, stents or surgical bypass is often required. If balloon angioplasty fails, symptoms will return; however, this procedure can be repeated with moderate success.

Stents

A stent is a small metal mesh tube that acts as a scaffold to provide support from within the blood vessel. Unlike balloons, a stent stays inside the artery permanently. Stents are often used when balloon angioplasty alone is unsuccessful, particularly for longer lesions.

Stents vary from balloon-expandable to self-expanding, which have different properties and are used for different types of arterial blockages. Covered stents incorporate synthetic fabric over the metal scaffolding and are designed to overcome some of the limitations of bare metal stents.

If there are more than a few arterial blockages, the outcome of stenting might be less favorable, and surgical bypass may be recommended. Stent failure generally results in a recurrence of symptoms and the need for surgical bypass.



1. A metal stent is advanced over a guidewire to the site of the blockage.

2. The stent is deployed and opens as a small, springy, mesh-like metal device designed to support the newly widened artery and keep it open. A balloon is used to ensure the stent is pushed against the arterial wall.

3. The stent remains in the artery for the rest of the patient's life while the guidewire and catheter are removed.



Developing a treatment and management plan with your physician is essential to a successful outcome.

Atherectomy

Atherectomy catheters can shave and remove atherosclerotic plaque from inside blocked arteries through several mechanisms ranging from high-speed rotational and grinding forces to laser. Atherectomy devices can sometimes be used as stand-alone therapy, but are often used as adjuncts to angioplasty and stenting. The long-term durability of atherectomy procedures remains unclear. In select circumstances, however, the devices remain important tools in the armamentarium of vascular specialists.

EXPERIENCE AND ASSESSMENT

For patients with symptomatic PAD, treatments have evolved and include best medical management, endovascular interventions, and surgical reconstructions. For best personalized and comprehensive vascular care, all patient factors need to be considered into designing vascular treatments that will optimize patient outcomes. Currently there is no single therapy, whether medical, endovascular, or surgical, that fits all patients. Careful patient assessment is the cornerstone to successfully managing PAD. Patients need to understand the risks and benefits of all treatment options and have a comprehensive discussion with their vascular specialists. Regardless of the type of therapy, however, vigilant lifelong post procedure follow-up is vital to sustaining good outcomes.

LIFESTYLE MODIFICATION

Despite the therapy chosen, your input and participation in your health are essential to a successful outcome. In fact, many patients with claudication benefit solely from lifestyle modification alone without the need for minimally invasive procedures. Nicotine abstinence, a walking exercise program and healthy eating can minimize or eliminate the symptoms of claudication and produce a more long-lasting effect than any other intervention. 

Ask Your Doctor

1. What do I need to know when deciding between minimally invasive and surgical treatment for PAD?
2. What can I do to optimize my outcome of stenting or surgery?
3. What are the potential complications of endovascular treatment?
4. If endovascular therapy doesn't work or fails, can I still have bypass surgery?

SURGICAL RECONSTRUCTION for PAD



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The need for leg amputation caused by critical peripheral artery disease (PAD) has been largely eliminated through the use of several methods for increasing blood flow around the blocked artery to perfuse the leg, foot, and toes of the ischemic limb.

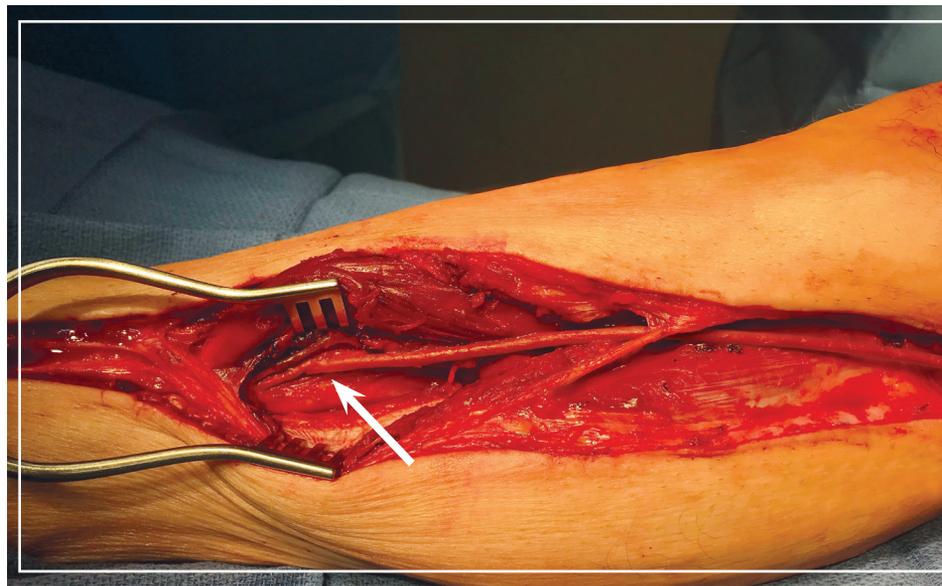
In general, these techniques either involve reopening the occluded arteries (with stents, angioplasty, or atherectomy) or re-routing blood around the blockage using a conduit made of either natural or synthetic material (in a surgical bypass).

WEIGHING THE OPTIONS

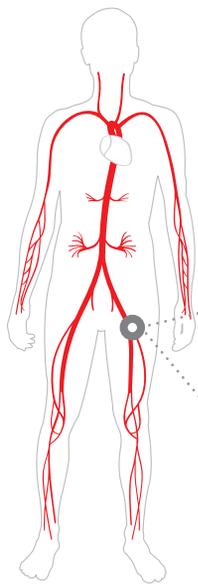
The decision to choose one procedure over another requires consideration of numerous factors. The degree of ischemia, the anatomic location of the disease, the patient's overall condition, the availability of suitable autogenous conduit (patient's own vein), any previous operations or procedures, and patient preference are all significant factors affecting the type of procedure selected. It is important that physicians caring for patient with PAD are well-versed on all of the treatment options available. A practitioner who only performs one type of procedure may be unfairly biased towards that particular treatment whereas a specialist who can perform all of the procedures available will be able to better weigh the risks and benefits of each option.

Bypass surgery is a very reliable and long-lasting method of increasing blood flow and is, in many ways, the gold standard for all interventions. Developed over the 1960s and 1970s, bypass surgery produces patency rates of 70% to 85% over long periods of time and achieves the primary goal of limb salvage in 85% to 90% of cases. But despite the good results of a surgical bypass, there are

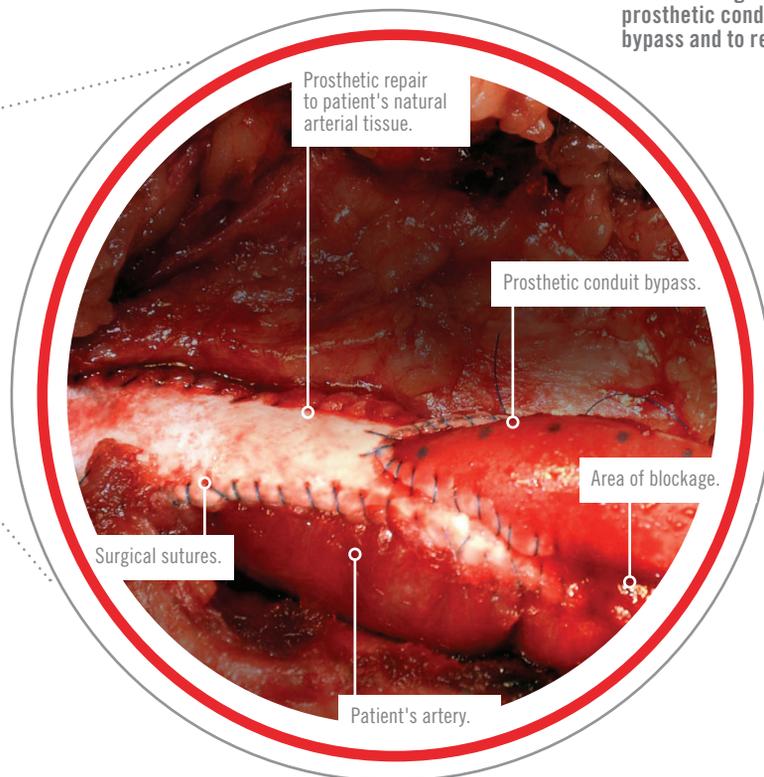
several reasons contributing to a push toward the use of angioplasty and other minimally invasive procedures that lack long-term data. First, by necessity, bypass surgery is invasive, and operations of this kind can be associated with significant (2% to 5%) mortality and wound complication rates in patients who often have a multitude of concurrent medical conditions. Second, bypass surgery is one of the most technically challenging operations for the vascular surgeon, and many practitioners have not been able to master these techniques. Given this fact, patients should inquire about the training, expertise, and results of the practitioner before entering the operating room or angiographic suite. Third, patients generally and understandably would prefer not to have a major surgical operation if this could be avoided.



Vascular surgeons perform 'bypass surgery' and replace the blocked arteries using a vein harvested from the leg. The vein is sutured to healthy artery above and below the blockage. This photo shows the vein sutured to a 2-3 mm tibial artery several inches above the ankle (arrow).



Vascular surgeons attach a synthetic prosthetic conduit to accommodate the leg bypass and to restore blood flow to leg.



BYPASS BASICS

In performing a bypass surgery, there are three main factors that are carefully evaluated. First, the bypass must start at an artery that has unobstructed, normal blood flow (the faucet). This is usually in the groin or upper thigh area. Second, there must be an open segment of artery below the obstruction that can potentially bring blood to the affected tissue in the calf, foot, or toes (imagine a lawn sprinkler). Lastly, and most critically, an appropriate conduit (the hose) must be used to connect the faucet to the sprinkler.

The best conduit for bypass is one of the patient's own superficial veins. These veins are often the perfect size and length for bypass and have natural resistant to clotting that allow for long-term patency. Veins are delicate and truly a limited resource; many patients do not have available vein as a result of having undergone prior heart bypass, vein stripping, or laser vein therapy. Transplanted veins taken from another living donor, even a family member, cannot yet be used because they provoke a strong immune response in the recipient. Cryopreserved or chemically preserved veins have been used, but these are not living conduits and do not function nearly as well as native vein. Artificial grafts have been extensively

employed in bypass operations and function well when the surgeon performs shorter-length bypasses of larger-diameter vessels. However, due to their propensity to clot, conduits made of artificial materials perform poorly when sewn to small arteries below the knee. While some improvements have been made, including the bonding of blood thinning medication on the inner surface, artificial grafts still perform worse than native vein.

In an ideal surgical situation, the patient's own vein is sewn to the inflow and outflow arteries to complete the bypass. Unlike an artery, however, the vein has valves to prevent reflux of venous blood. These valves must be circumvented when using the vein as the conduit in a bypass. One common method of preparation is to take the vein completely out of its surrounding tissue and then to reverse its direction before attaching the ends. Alternatively, the vein may be left in its natural bed and the valves carefully divided to allow flow from the upper leg to the lower leg. Both options require careful and meticulous surgical technique, as any injury or damage to the delicate vein can lead to early clotting and failure of the bypass.

CHOOSE WISELY

Despite the availability of percutaneous treatments, surgical bypass for PAD remains an effective and durable option in many cases. The decision to employ such an involved and invasive technique is difficult and complicated but should not deter the practitioner and patient from discussing all potential treatments. It can sometimes be the best first-line option for the patient! 🩺

Ask Your Doctor

1. Am I a suitable candidate for surgery to treat my PAD?
2. What are the possible complications?
3. How long will my recovery take?

OPTIMIZING Wound Care



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The treatment of both acute and chronic wounds has been practiced and studied as far back as we have written records. As surgery and anesthesia have evolved, the art of wound healing has also made significant progress.

Basic science has led to a better understanding of the physiology of wound healing. Concurrent with the growth in our knowledge regarding wound healing, wound care products have greatly expanded, and wound treatment strategies are far better delineated. Despite these advances, there is still much to be learned about the care and treatment of wounds.

Wound healing occurs whenever an acute injury takes place. Wounds can heal in a number of ways. Primary wound closure, by approximating the edges of the wound together usually with sutures, staples or glue, results in a faster healing of the wound. Wound healing by secondary intention is the process by which the wound is intentionally left open and the wound closes on its own, assisted by a variety of dressings and wound care products. Delayed primary closure describes wounds that are sutured after having been left open for a period of time.

HOW WOUNDS HEAL

All wounds undergo the same biological processes of healing after the initial injury. The stages of wound healing include:

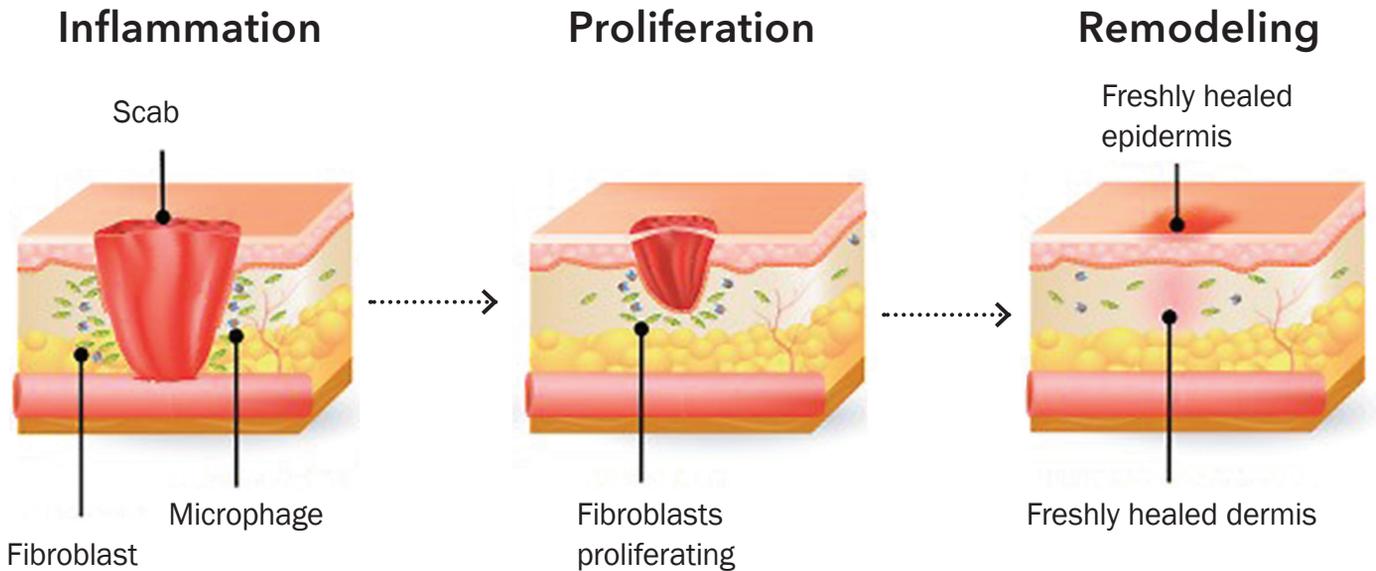
1. The inflammatory or reactive stage.
2. The proliferative or regenerative stage.
3. The remodeling stage.

In the initial reactive phase, after bleeding stops, a multitude of different cells migrate into the wound and surrounding tissues, and various cellular products are secreted that encompass the inflammatory response. During the proliferative phase,



Ulcer secondary to atherosclerosis and lack of blood supply.

Stages of Wound Healing



Healthy wound healing involves fibroblasts (connective tissue cells) and macrophages (blood cells of the immune system that fight infection).

new blood vessels are formed, fibroblasts and related cells make collagen and elastin that regenerate the tissue matrix, and lining cells multiply, resulting in epithelialization or the creation of new skin. In the final stage of wound healing, there is remodeling of the wound and skin, a process that occurs over days to years. In chronic wounds, one or more of these stages of wound healing do not progress normally. There are many possible reasons for the non-healing or slow healing of the wound; identifying and modifying these factors are essential for the eventual successful wound closure.

BARRIERS TO HEALING

Identifying the barrier(s) to wound healing is the most important first step in treating patients with chronic wounds. The patient's history is exceedingly important in identifying underlying medical problems and conditions that can potentially impact wound healing. Diabetes mellitus is one of the most common systemic diseases that can adversely affect local wound healing. Studies have shown that patients who

are able to better control their glucose levels (that is, maintain a more normal HbA1c) tend to have better wound healing outcomes than their counterparts whose glucose is less well-controlled. Diabetes is also associated with peripheral vascular disease, cardiac disease, and microcirculatory disorders, conditions which are known to affect wound healing. Patients with diabetes have a higher risk of infection due to problems with their immune response. Repeated trauma secondary to nerve damage called, *neuropathy* is a common cause of the initial injury among individuals with diabetes. Satisfactory control of blood glucose is always an essential component in managing these diabetic patients with an active wound.

In the lower extremity, peripheral artery disease (PAD), venous disease, and neuropathy can impact wound healing. These conditions frequently co-exist at the same time and management of these conditions are essential to wound healing.

IMPORTANCE OF BLOOD FLOW

At the cellular level, oxygen is vital to wound healing. Tissue ischemia leads to an increased risk of infection and it can potentially impair the different stages of wound healing. If significant PAD is present, it is important to improve the arterial circulation to the wound. Better arterial inflow to the wound will increase the delivery of oxygen and nutrients to the healing tissues.

Arterial ischemia can be diagnosed by history, physical examination, and with noninvasive vascular studies. More advanced modalities such as CT angiogram can be used to better localize the arterial blockage. Minimally invasive percutaneous techniques such as balloon angioplasty and stents have revolutionized the treatment of arterial occlusive disease. Open surgery is available for patients who are not candidates for minimally invasive intervention. The restoration of arterial flow will improve wound healing.

SPECIFIC CONDITIONS

Neurotrophic ulcerations in the foot or leg should be treated by reducing external pressure (offloading) in the area of the ulcer. Custom-designed footwear, contact casting, and non-weight bearing are ways to reduce the external pressure on the wounds. Internal offloading can help reconstruct bone deformities that may have contributed to the ulcer. Some patients have a combination of these problems, making treatment complicated.

Other medical conditions can inhibit the immune response, leading to poor wound healing. For example, obesity and nutritional deficiencies can impede the healing process. The presence of significant bacteria (bioburden) and infection can impair wound healing as well, and a local infection can progress to a systemic infection or sepsis, resulting in a life-threatening condition if not properly treated. Prior radiation in the area of the wound can exacerbate local tissue hypoxia, increase risk of infection, and result in poor local cellular responses to healing. Some medications can affect the immune system and studies have shown that smoking can also slow healing. Additional barriers to wound healing exist such as poor patient compliance, socio-economic issues, and the high cost of medical supplies.

TREATMENT APPROACHES

The principles behind good wound management include protecting tissues from any further injury, satisfactory infection management, reduction of edema with compression

and elevation, reduction of excessive oozing called, *exudate*, and the removal of nonviable tissues. There are presently many dressings and wound care products available for treatment, including those that provide growth factors and matrix to the wound bed. Bioengineered skin-like products are also available. Negative pressure wound care is being used extensively in both inpatients and outpatients. These products effectively decrease edema and exudate. Offloading strategies, either external (a cast or other device) or internal (through surgery), can prevent continued injury. Treatment strategies should be individualized, guided by the specifics of the patient and the wound.

Hyperbaric medicine has been used as an adjunct to wound treatment in selected cases. Studies have shown that increasing the partial pressure of oxygen at the tissue level can impede bacterial growth and promote neovascularization and healing. Dedicated wound care centers can provide access to advanced healing techniques, dressings, wound care products, and hyperbaric oxygen treatments.

Chronic wounds are a major health problem. Many options are currently available for chronic wounds. No single treatment exists to heal all wounds. Wounds that do not heal should be approached in a multidisciplinary fashion. 🇺🇸

Ask Your Doctor

1. What options do I have to treat my wound?
2. How can I minimize my risk of developing a wound?
3. How long should I wait before asking about a wound that won't heal?

HEALTHY LIVING for the Vascular Patient



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By 2019, the U.S. Census estimates that the last of the baby boomers (those born between 1949 and 1964) will reach age 55. By 2030 the population of individuals over the age of 65 is expected to increase by over 70% and one in five Americans will be a senior citizen.

Since vascular disease primarily affects seniors, the number of vascular disease cases is expected to rise dramatically. The vascular system is made up of arteries and veins that carry oxygen-rich blood throughout the body to the vital organs, the brain, and the legs. As we age, our arteries tend to thicken with a buildup of plaque and cholesterol, get stiffer, and narrow. When blood flow is restricted, vascular diseases such as carotid artery disease (CAD) can lead to stroke; peripheral artery disease can lead to problems walking and in the most advanced cases, foot ulcers, gangrene, and possible amputation; and abdominal aortic aneurysm can result in death if not treated early.

Taking steps to lower the risk for vascular disease is crucial for individuals of all ages especially baby boomers who have been exposed over their lifetime to many risk factors associated with vascular disease. The five lifestyle modification practices highlighted below are not new. By implementing a few, if not all, we may be able to prevent vascular disease or at least decelerate the occurrence of many cardiovascular events.

SMOKING CESSATION

Smoking cessation is perhaps the most powerful of healthy lifestyle changes. Tobacco use ranks highest on the list of preventable causes of death worldwide. For example, people who smoke 20 cigarettes per day have a risk of heart

attack that is six times that of nonsmokers. Smoking cessation begins having effect in reducing the CVD risk within a few of months of quitting. In just 3 to 5 years, the CVD risk in a former smoker decreases to that of a nonsmoker and existing atherosclerotic process if already has started at least stops to progress.

Stopping tobacco use is difficult, at best, and can often take multiple attempts. ***Don't be discouraged.*** There are drugs such as Chantix (varenicline, Pfizer, Mission, KS) and weaning tools such as NicoDerm patches and Nicorette gum (GlaxoSmithKline, London, UK) that may help. There are also many sources of counseling and support through the American Heart Association, church groups, hospitals, and other organizations. Remember that weaning tools still have the negative effects of nicotine on blood vessels and are not totally free of CAD risk. Switching to "electronic cigarettes" does not count as smoking cessation as electronic cigarettes are associated with many devastating health conditions.

BLOOD PRESSURE CONTROL

Exercise and weight control are important components of any program for blood pressure control. First, high blood pressure has to be recognized through blood pressure measurement at screening fairs, drugstores, at home, or as part of a routine physical exam. Thirty minutes of exercise a day, at least

five times a week, can help control blood pressure as well as weight—start slowly and work your way up. Diet is also a mainstay of blood pressure control with special emphasis on sodium intake. Weight loss may normalize blood pressure in individuals that have been overweight. Nutrition awareness is a big help here. High blood pressure should also be addressed with a primary care practitioner for medical treatment with anti-hypertensive agents when none of the above works.

EAT HEALTHILY

Major risk factors leading to atherosclerosis are hypertension, diabetes, obesity, and high cholesterol, all of which are profoundly affected by our diet. It has been traditional knowledge for generations that a healthy diet is associated with better health.

Protect with produce

Many published studies show the more fruits and vegetables you eat, the less your likelihood of developing vascular problems. Fruits and vegetable are low in lipids and proteins that may cause inflammation in our system. This inflammation is responsible for atherosclerosis and vascular disease. Fruits and vegetables are rich sources of vitamin C and potassium, two nutrients that are especially associated with improved endothelial function and suppression of inflammatory processes. Alternatively, it may be that a diet rich in produce leaves less room for unhealthy substances. Don't rely on individual supplements of these nutrients, however, as that has been shown to be ineffective or even harmful. Instead, when choosing or planning meals, aim to load half your plate with fruits and vegetables.

Slash sodium

Limiting excess sodium seems to keep blood vessels healthier. All people over the age of 50, all African Americans, and anyone who already has high blood pressure, diabetes, or kidney disease are

urged to keep daily sodium intake to no more than 1,500 milligrams. Everyone else should strive for no more than 2,300 milligrams a day. Processed foods, soups, snack foods, and diet salad dressings are all very high in sodium and need to be avoided or used in limited amounts. The best ways to achieve these targets is to eat fewer processed foods such as canned, frozen, or ready-to-eat convenience or fast foods, and to fill your salt shaker with herbs and spices rather than salt of any type. Plus, read the Nutrition Facts labels on food packaging for sodium content and choose items with lower numbers.

Reduce sugar intake

A diet high in sugar and refined carbohydrates (e.g. white bread) has in recent studies shown to negatively affect lipid profiles—it lowers good cholesterol, increases bad cholesterol, and elevates triglyceride levels. The popularity of sugar and refined carbohydrates has contributed to the obesity epidemic in the United States and the rise of the metabolic syndrome, both of which are major risk factors for atherosclerosis and vascular disease. Carbohydrates raise blood sugar levels and trigger the release of insulin. A diet high in refined carbohydrates has the effect of causing an exaggerated insulin release, which is associated with insulin resistance and the development of type II diabetes. A low-glycemic diet consisting of whole grains (complex carbohydrates), fruits and vegetables, and legumes (beans, peas, and lentils) can counteract the

development of insulin resistance. Excellent sources of complex carbohydrates are whole-grain breads, oatmeal, and brown rice. The American Heart Association recommends that people consume only 5% of their daily calories as added sugar.

Antioxidants

Antioxidants are natural substances that exist as vitamins, minerals, and polyphenols, among others. Many antioxidants are identified in foods by their distinctive colors: the deep red of cherries and tomatoes; the orange of carrots; the yellow of corn and saffron; and the blue-purple of blueberries, blackberries, and grapes. The most well-known compounds with antioxidant activities are vitamins A, C, and E; beta-carotene; the mineral selenium; and the compound lycopene.

Antioxidants help prevent disease by blocking free radicals, a byproduct of oxygenation that causes inflammation and cellular damage that leads to the development of atherosclerosis. An increasing body of evidence points to beneficial effects from the antioxidants present in grapes, dark chocolate, blueberries, and tea on cardiovascular health.

Watch your waistline

Undesirable weight gain has been linked to increases in arterial stiffness. Less supple arteries lose their ability to function as needed. Data show that as visceral fat (popularly known as belly fat) increases, so does stiffening of the



arteries. It is thought that excess body fat creates a series of processes in the body that disrupt vascular structure and function. Knowing your waist measurement (via the aid of a tape measure) is a better harbinger of risk than paying attention to your body mass index alone. Cutoff points for waist size include keeping to 35 inches or less for women and less than 40 inches for men.

MAINTAIN GOOD CHOLESTEROL LEVELS

High cholesterol is one of the major controllable risk factors for coronary heart disease, heart attacks, stroke, and peripheral vascular disease. When too much bad cholesterol (low-density lipoprotein or LDLs) circulates in the blood, it builds up as plaque in the arteries. This buildup causes narrowing or stenosis, stiffness, and endothelial dysfunction leading to vascular disease and its complications. Saturated fats and cholesterol are primarily derived from animal fats contained in red meats, dairy products, and processed foods enriched with partially hydrogenated fats. Limiting how much saturated and trans fats you eat is an important step to reduce your blood cholesterol and reduce your risk of vascular disease. Saturated fats should constitute less than 7% of your total daily calories (140 out of an average 2,000-calorie-a-day diet), and trans fats are best avoided completely. Dietary cholesterol should be kept to less than 300 mg per day for healthy adults and less than 200 mg per day for adults with elevated cholesterol or history of cardiovascular health problems.

It's important to note that not all fats are detrimental, and many are actually beneficial to your vascular health. Monounsaturated fats, which are found in plant products such as olive oil or avocados, and polyunsaturated fats found in nuts and seeds, are beneficial to your vascular health and help lower your total blood cholesterol. Also remember that all fats are high in calories and thus should be consumed in moderation. Lastly, fish is an excellent alternative to high-fat meats. Many types of fish are rich in omega-3 fatty acids, which can reduce levels of another "bad" blood fat called triglycerides.

The highest concentrations of omega-3 fatty acids are found in cold water fish such as salmon, mackerel, and herring. Other sources are flaxseed, walnuts, soybeans, and canola oil. If you are allergic to fish or just can't meet that weekly goal, ask your doctor if it is safe for you to take a fish oil supplement. Look for a brand that contains a combined total of 500 to 1,000 milligrams of eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA).

EXERCISE REGULARLY

Not only does exercise help keep weight in check, it also provides additional perks for blood vessels and seems to keep arteries less stiff. Exercise may help by keeping arterial blood pressure from increasing. Or it may increase production of nitric oxide, a substance produced in blood vessel linings, which helps to dilate arteries and prevent fatty deposits from sticking to vessels.

So, how much exercise do we need? The first Surgeon General guidelines were published in 1996. The recommendation was for 30 minutes of "moderate" physical activity at least 5 to 6 days per week, but preferably every day. Recommended activities included swimming, brisk walking, cycling, and even higher-intensity house and yard work. Given the constraints of modern work schedules, recommendations were made to pick activities that are easily accessible, are safe and enjoyable, and have few negative consequences such as injury, peer pressure, or poor self-identity.

Most important, any significant change in activity level or exercise should be reviewed with your physician before you begin. Care should be taken to avoid musculoskeletal or overuse injuries, especially early in a program. Any plan should include stretching and exercises to increase flexibility.

EARLY DETECTION

If you are diagnosed with vascular disease, early detection can decrease the risk of treatments and improve the length and quality of your life. There are noninvasive exams that can determine if there are blockages in extremity arteries or arteries at the neck that are perfusing the brain (carotids) or if there is dilation of the aorta that may lead to aneurysm formation. All these conditions may turn out to be life-threatening if they are left unchecked. So, staying vigilant about reducing risk factors and having regular checkups with your primary care physician and vascular specialist are important. 🦋



Ask Your Doctor

1. What can I do to reduce my risk of vascular disease?
2. Do I need to take any special precautions when exercising?
3. Do I have any dietary restrictions?

A PATIENT'S STORY: Marcia

Marcia, a vibrant, outgoing 81-year-old woman, has been active all of her life until recently.

She is the mother of four grown children and ran her husband's medical office until she was 74. She remembers, "I had to remain on my feet all of the time." She also played golf and tennis regularly.

Several years ago, Marcia developed pain and discomfort in her left leg. The pain slowed her down and limited her ability to play golf and sometimes even affected her day-to-day activities. Months went by, and the pain progressed in severity. Ultimately, Marcia developed a foot ulcer, which finally sent her to her primary care physician.

Marcia initially believed that the sore was due to old age and thought "if I ignored it long enough, it would go away." Her doctor knew the wound was serious and sent Marcia to the emergency room in an ambulance. After being evaluated by vascular surgeons, Marcia was found to have limb-threatening ischemia. Her condition was too far advanced for minimally invasive endovascular procedures such as angioplasty or stenting and required emergency surgery to save her leg. The vascular surgeons performed a bypass that extended from unobstructed arteries in her groin to arteries in her calf using a superficial vein taken from another spot in her leg.

The surgery was successful in re-establishing blood flow to her foot. A few weeks after the procedure, Marcia was seen in the office for a follow-up visit, and the wound and her surgical incision were healing nicely. When asked about her ordeal, she said, "The toughest part of surgery wasn't the surgery at all, but



the recuperation and physical therapy afterward." Fortunately, Marcia recovered from surgery, the bypass kept her limb alive, and she learned to get back on her feet again.

TROUBLE STRIKES AGAIN

Shortly after the first surgery, Marcia developed a similar pain in her right leg. It felt like a "bad back pain that traveled all the way down from the knee to the foot." These are common symptoms of arthritis or sciatica and again were dismissed at first until Marcia developed ulcers on her right foot that wouldn't heal. Although Marcia's symptoms were different from the ones she had experienced before, she realized that waiting was not an option and called her vascular surgeon for an evaluation. Her workup included an arteriogram (a minimally invasive imaging technique that visualizes the inside of the blood vessels), which showed a severe blockage in the right popliteal artery behind her knee. For this type of occlusion, a minimally invasive procedure was feasible, but not necessarily the most durable option for long-term success. Instead, Marcia underwent another surgical bypass

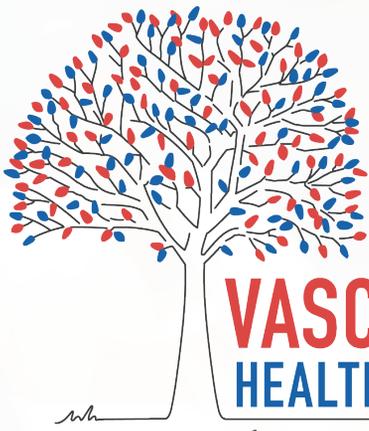
to restore blood flow to her right leg.

Marcia required rehabilitation for a couple of weeks after the surgery and has recovered well. With the help of her primary care physician, the vascular surgeons, the nurses, and the physical therapists, she avoided amputation and continues to live independently. Over the past several years, Marcia has learned to be proactive about her vascular care and sees her doctors routinely for follow-ups.

SPEAK UP FOR YOUR HEALTH

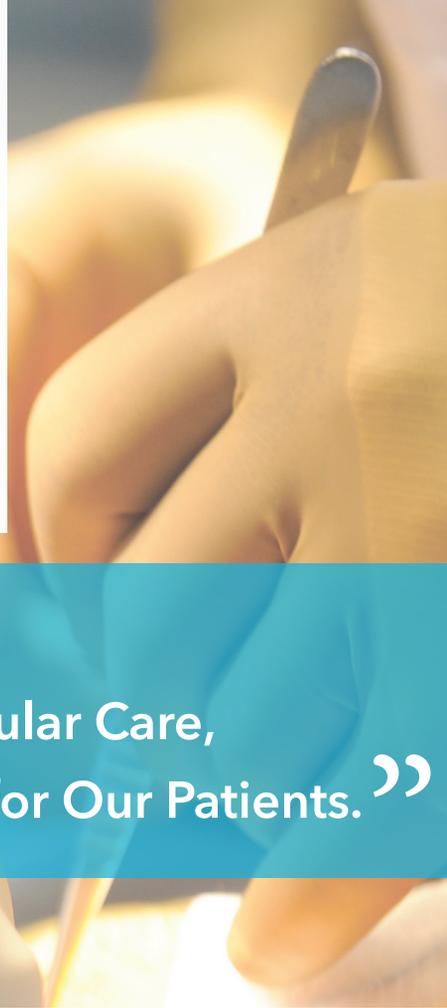
"If you feel like something is wrong with your vascular health, don't ignore it," Marcia says, "because it probably won't go away. Speak up." She has learned that early intervention is very crucial to a successful recovery. "Even though I have matching scars on the insides of both my legs, the surgeries were worth it. I would have lost my legs without surgery."

At the present time, Marcia uses a walker to steady herself when she walks, but she still gets around quickly. "I miss my golf and tennis the most. I probably will never be able to go back to playing them. My goal right now is to be able to start driving again soon." 🇺🇸



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