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Message from the Chief

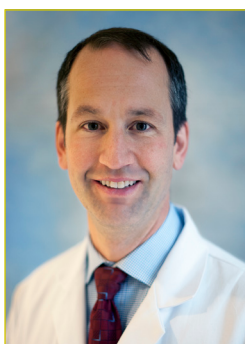
Dear Readers,

Diseases affecting the circulatory system (including all the arteries and veins throughout the body) are very common — and they are becoming even more common as the rates of obesity and diabetes continue to climb. Some readers will have a loved one who has had a stroke, while others have relatives with atherosclerosis or peripheral arterial disease. If you have diabetes, a sedentary lifestyle, or are a current smoker, you too could have risk factors for vascular disease. But the more we know about vascular disease, the better able we are to make different choices about our health.

This issue highlights a few areas of vascular surgical expertise at NewYork-Presbyterian/Columbia University Medical Center. We are particularly pleased about the new aortic center, which provides integrated care for patients with aortic aneurysms and dissections, serious forms of vascular disease. We hope you find this information helpful, and we look forward to hearing from you.

Richard Green, MD

Associate Chief, Division of Cardiac, Thoracic and Vascular Surgery



*Michael Borger, MD, PhD
Surgical Director,
Aortic Surgery Program*

Aortic Aneurysm Surgery

Numbers matter.

Some of us may not consider numbers to be our area of expertise, but when we're talking about matters of life and death, numbers can suddenly become very important.

Here are a few to consider.

An aortic aneurysm is a bulge in the aorta, the largest blood vessel in the body. Aneurysms can form in the chest or abdomen (or both). Sixty percent of aortic aneurysms involve the part of the aorta that extends immediately from the heart. Forty percent occur in the segment extending into the abdomen. The larger the aneurysm grows, the greater the chance it may dissect or rupture, which is life-threatening.

Abdominal aortic aneurysms (AAA), or aneurysms in the abdominal part of the aorta, are the 13th leading cause of death in the United States and the 10th leading cause of death in men.

Aortic Aneurysm ~ Continued on page 2

More from the Department of Surgery experts at:

www.facebook.com/columbiasurgery www.twitter.com/columbiasurgery www.columbiasurgery.org

NewYork-Presbyterian's aortic surgeons had a 100% success rate (data from 2013-2014) in treating abdominal aneurysms involving the arteries of the kidneys (infrarenal aneurysms).

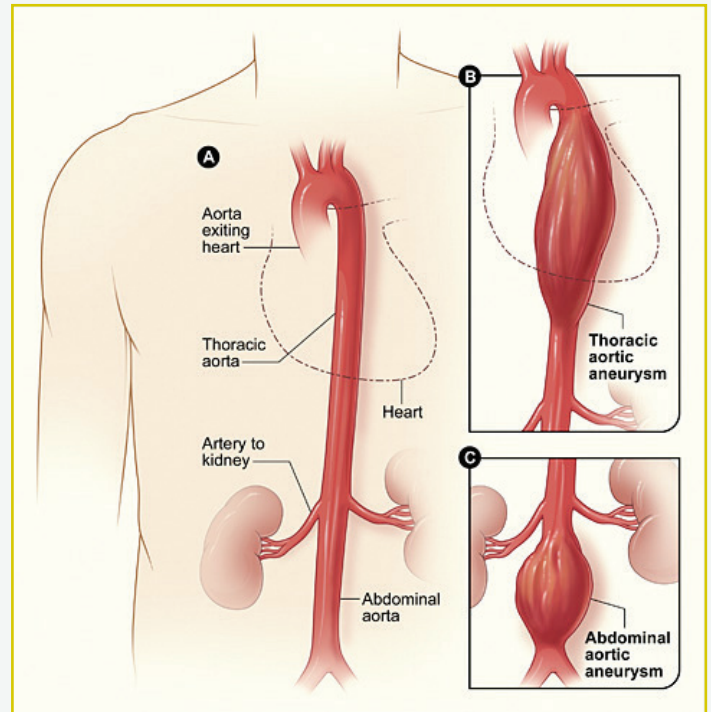
This success has become possible through the creation of a comprehensive Aortic Center at NewYork-Presbyterian/Columbia University Medical Center. This integrated program, directed jointly by cardiac and vascular surgeons in the Department of Surgery, features a 24/7 on-call team of cardiologists, vascular surgeons, cardiac surgeons, and interventionalists who specialize in the treatment of aortic aneurysms and dissections. This team is carefully coordinated by **Tracy Andrews, DNP, ACNP**, a highly experienced cardiac surgical nurse practitioner, who rapidly assesses incoming patients, obtains critical test results, and directs patients to the appropriate specialists for treatment.

This unusual collaboration provides expert care for patients with all types of aneurysms and dissections, and is particularly important in the case of aneurysms and/or dissections that require both cardiac and vascular expertise.

Prior to the development of the Aortic Center at NYP/Columbia, aneurysms were treated by different specialists depending on whether they were located above or below the diaphragm, explains **Dr. Richard Green, Director of the Division of Vascular Surgery and Endovascular Interventions**. Thoracic aneurysms (those above the diaphragm) were traditionally treated by cardiothoracic surgeons, and those below the diaphragm, in the abdominal cavity, were the purview of vascular surgeons. But experience has taught the team that the best results are achieved when cardiac and vascular surgeons work together to ensure optimal care of the entire aorta.

About aortic aneurysms

Aneurysms are areas in which the aortic walls are weakened, thinned and distended, similar to the way that a balloon bulges outward as it is blown up. Aneurysms may occur in any part of the aorta. If the aneurysm occurs near the heart or above the diaphragm, it is considered a thoracic aortic aneurysm and if it is below the diaphragm in the abdominal cavity, it is considered an abdominal aortic aneurysm. Aneurysms that occur right where the aorta extends from the heart, called aortic root aneurysms, may impair the function of the aortic heart valve and reduce blood flow to the rest of the body. Some aneurysms involve both thoracic and abdominal sections of the aorta.



An aneurysm may develop in any part of the aorta. Aneurysms involving both thoracic and abdominal sections may require complex treatment such as an elephant trunk procedure.

Smaller aneurysms may be monitored and may not enlarge to the point of requiring surgery, but an aneurysm that enlarges to 5 cm or more is at risk for tearing, or dissection. Dissection is a life-threatening emergency that requires immediate surgery. Ideally, aneurysms are detected and monitored or treated before any symptoms occur; in some cases, aneurysms are detected incidentally during X-rays or CT scans for other conditions.

Treatment of aortic aneurysms

At NewYork-Presbyterian, aneurysms can be successfully repaired with excellent outcomes and with mortality rates well below national rates. For instance, consider the average death rates of patients undergoing minimally invasive repair of abdominal aortic aneurysms. Nationally, an average of 3% of patients undergoing elective surgery die, and during emergency surgery, the rate of death is 13%. At NewYork-Presbyterian, the mortality rate for both elective and emergency surgical patients was 0.0% in 2014.

One of the keys to the successful treatment of aortic aneurysms is careful monitoring and referral for surgical consultation to avoid rupture or dissection of the aneurysm. Another factor in the center's high success is its surgeons' expertise in determining which treatment approach is ideal for each patient. "Every approach has unique benefits and

risks,” says **Michael Borger, MD, PhD**, *Surgical Director of the Aortic Center*. It takes experience to know which treatment will be the right one for each patient.”

The Aortic Center offers the full spectrum of care for both aortic aneurysms and dissections, including the following:

- Open surgical repair of aortic aneurysms and dissections. About two-thirds of aortic procedures are performed through traditional surgery.
- Minimally invasive endovascular stent grafting accounts for about one-third of aortic procedures. These include endovascular aneurysm repair (EVAR) for abdominal aortic aneurysms, and thoracic endovascular aneurysm repair (TEVAR) for thoracic aortic aneurysms. EVAR and TEVAR are performed through catheters rather than open surgery, and afford patients a faster, easier recovery than after open surgery. Surgeons at the Aortic Center also implant special stents with customized bifurcations, or branches, to accommodate smaller arteries branching from the aorta. Few other centers have the advanced expertise to create and implant these specialized stent grafts, which make it possible to treat aneurysms close to the renal arteries.
- Hybrid approaches combine a conventional surgical technique with an interventional or endovascular approach.

Aortic root aneurysms

Treatment of aortic root aneurysms has traditionally required replacement or repair of the aortic heart valve as well as the ascending aortic tissue (the part of the aorta that extends upwards from the heart). However NewYork-Presbyterian surgeons have significant experience utilizing aortic valve-sparing techniques, also known as the *David procedure*, which allow them to replace the diseased part of the aortic root while preserving the patient’s native aortic valve. Leaving the patient’s aortic valve intact spares patients from limitations and potential complications associated with prosthetic heart valves.

If the patient’s aortic valve is too damaged and needs to be replaced, the program has extensive expertise in the full scope of options, including:

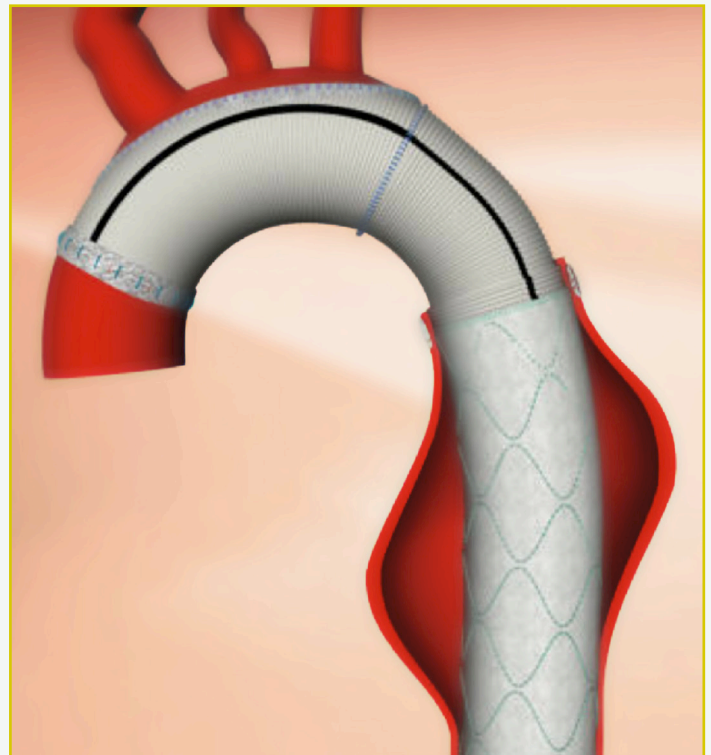
- Replacement of the aortic root and valve with a biologic aortic root-valve conduit developed by surgeons in our program;
- Reconstruction of the aorta and aortic valve with the aid of a human cadaveric aorta;

- The Ross procedure, which entails replacing the diseased aorta and valve with pulmonary tissue;
- Replacement of the entire aortic root and aortic valve with a combination of a mechanical valve with an attached tube graft.

Returning our attention to the numbers, surgeons at the Aortic Center had a 0% mortality rate for elective valve-sparing ascending aortic repair in 2014 and 2015, compared to a national 3% mortality rate. Among patients requiring emergency aortic arch surgery, our program had a 4.7% mortality rate compared to 10.9% mortality across the country. Complications such as renal failure, infection, and stroke were also far below the national average. “When it is you or a loved one in question, those outcomes make a difference,” says Dr. Green.

Elephant trunk procedures

About 11% of patients have aneurysms that affect both thoracic and abdominal sections of the aorta. Co-directors Michael Borger, MD, PhD, and Richard Green, MD, perform the elephant trunk procedure, a two-staged procedure, in certain patients with such complex aneurysms.



In the elephant trunk procedure, the aortic arch is repaired first. During this first phase, the aorta is prepared so that it can easily accept a thoracic stent graft, which is then placed in the second stage of the procedure.

Vascular Access:

Creating and Protecting Dialysis Patients' Lifelines

For decades, patients with failing kidneys have been sustained by hemodialysis, or dialysis for short – the process of removing the blood from the body, filtering it through a machine, and returning it back to the body. Today dialysis is a life-saving option for over 600,000 people in the U.S., usually in the form of several treatments per week. That number of patients is growing due the rising incidence of diabetes, which can cause kidney failure, as well as other factors such as the use of medications that contribute to kidney failure. No matter the cause of kidney failure, every dialysis patient must have what is called vascular access. As the National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK) describes it, vascular access is so important that it can be considered ‘a hemodialysis patient’s lifeline.’ This is a specially prepared entry point where the dialysis needle will be inserted during every treatment; without it, dialysis cannot be performed.

There are three primary types of vascular access, each with its advantages and disadvantages.

AV fistula: arteriovenous (AV) fistula is the connection of an artery to a vein, usually in the forearm. Creating this connection causes extra blood to flow through the vein, which makes it grow larger and stronger. This allows for repeated use during dialysis. Untreated veins cannot be used for repeated dialysis because they would collapse. AV fistulas are considered the most ideal type of vascular access because they provide good blood flow, they are the least likely type to become infected or cause clots, and they last the longest.

After surgery to create an AV fistula, it is not immediately ready for use: the fistula must ‘mature.’ This process, in which the vein grows larger and thicker, may take two to three months.

AV graft: An arteriovenous graft is similar to that of an AV fistula, but instead of connecting the patient’s artery to vein, a teflon tube is used to connect these vessels. An AV graft may be used if the patient’s blood vessels are too small or clotted to create an AV fistula. AV grafts mature more quickly than fistulas (two to three weeks, rather than months), but they are more prone to infection and clotting, and are therefore used far less commonly.

Venous catheter: A venous catheter is a thin tube inserted into a vein in the neck, chest, or groin. Venous catheters can be used for dialysis right away, which is important if a patient has a sudden kidney problem and cannot wait for a

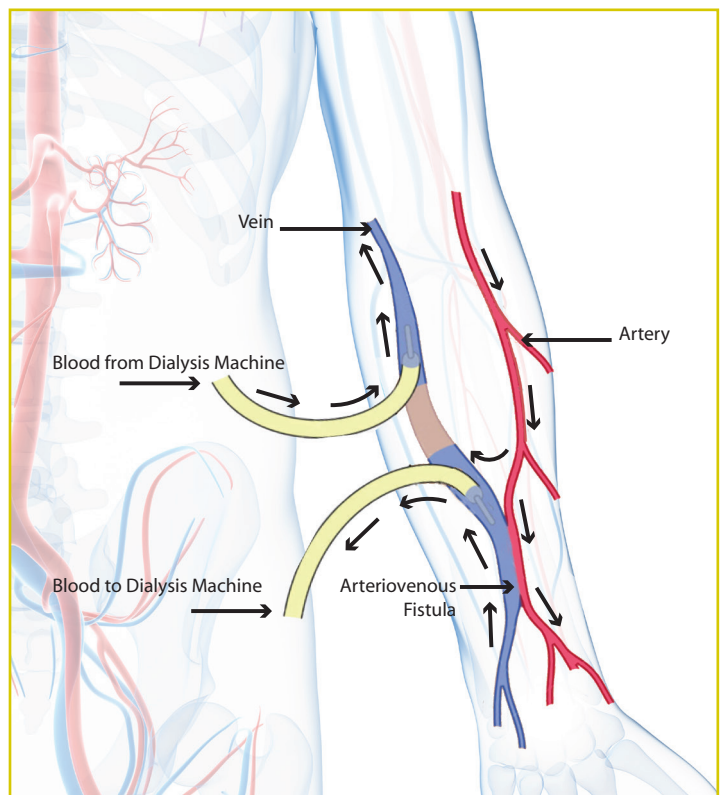


Nicholas J. Morrissey, MD
Associate Professor of Surgery

fistula or graft to mature. Venous catheters are the most likely of all three types to be compromised by infection and clotting, and are therefore used only for short-term dialysis.

Dialysis access procedures are performed by vascular surgeons such as **Dr. Nicholas J. Morrissey**, Associate Professor of Surgery and Bicampus Director of Clinical Trials for the Division of Vascular Surgery. Dr. Morrissey performs about 90% of dialysis access procedures at NewYork-Presbyterian/Columbia’s Department of Surgery.

Once the AV fistula or graft is in place, his job is far from done: ongoing maintenance of the access is crucial to the patient’s long-term health and well-being. Narrowing of the vascular access is common, most often due to the formation of scar tissue. Infection and clotting are also fairly common complications. For a patient whose life depends on regular cleansing of the blood, the last thing he or she needs is to arrive for treatment and find his or her lifeline obstructed. “Dialysis access points need to be continually and



Arteriovenous Fistula

Vascular Access ~ Continued on page 5

carefully monitored. If the vessels show narrowing, they may need to be reopened with an angiogram or stent,” explains Dr. Morrissey. If an access fails, the patient may have to have a new one created.

As with most things in life, prevention is worth its weight in gold. Patients can help to avoid access failure by being vigilant about any signs of infection, reduced blood flow, or other problems.

Access failure can be prevented through steps including:

- Not allowing anyone to draw blood from the arm where the access is located
- Have kidney function assessed routinely
- At every dialysis session, check to see if dialysis is proceeding efficiently or if blood is not clearing well.
- Note any prolonged bleeding after removal of the needle; excessive bleeding could indicate high pressure that could indicate failure.
- If there are signs of high pressure, or if the alarm goes off during dialysis (indicating a possible blockage), patients should seek evaluation of their access immediately.

“If we can identify and preserve good veins, a person can get through his or her entire life with one access,” says Dr. Morrissey.

As the need for dialysis continues to grow, Dr. Morrissey is on the forefront of research in developing improved surgical techniques, as well as identifying the best practices for preserving and maintaining a patient's access. Later this year, he will direct a trial of an endovascular approach to creating AV fistula; this minimally invasive method allows surgeons to create the access through a catheter, using angiography rather than open surgery. Although this approach has been in use outside the U.S., this upcoming trial will represent its debut here in the States.

Dr. Morrissey is also coordinating research that will track patients long term and help to identify factors that predict access failure, so that surgeons can intervene before failure occurs.

The Division of Vascular Surgery and Endovascular Interventions works very closely with specialists in nephrology, diabetes, and others at NYP/Columbia to ensure that patients who need vascular access receive prompt and seamless care. ■

For more information about vascular access surgery or maintenance, please call 212.342.3255.

The first stage of the elephant trunk procedure prepares the descending aorta in such a way that it will facilitate surgical replacement or stent graft insertion during a second procedure. The timing of the second procedure is dependent on many factors and requires assessment on a patient-by-patient basis. According to Tracy Andrews, the two-part approach is needed because attempting to repair both the thoracic and abdominal portions in a single procedure would require that the patient be under anesthesia for too long and would expose the patient to excessive surgical risk. “The elephant trunk followed by TEVAR or a second surgical procedure reduces the risk of kidney damage and other complications associated with a large, single stage procedure,” says Dr. Borger. “In cases where aneurysms involve the descending thoracic aorta, the elephant trunk followed by TEVAR produces the best outcomes.”

Genetic Testing and Counseling

Along with medical and surgical care, the center provides genetic testing and counseling in order to identify and optimally treat connective tissue disorders and other genetic conditions underlying aneurysmal disease. Geneticist Wendy Chung, MD and the Cardiogenetics program at NYP/Columbia provide the most thorough and sophisticated genetic testing and counseling available in the country. Testing and counseling is extended to family members as well as patients, so that prevention and early detection plans can be implemented. According to Dr. Green, identifying genetic factors underlying aortic disease is crucial to helping the team determine what treatments will be best for which patients.

Monitoring and Surveillance of Aneurysms

Whether or not patients undergo surgery, the Aortic Center at NYP/Columbia offers a unique approach to ongoing surveillance that includes collaboration with internal medicine, cardiology, and other specialties at NYP/Columbia. The multidisciplinary team meets bimonthly to discuss complex cases and offers comprehensive management follow-up with referral providers.

The Aortic Center is committed to nothing less than being the best surgical center in the country for the treatment of aortic aneurysms and dissections. In pursuit of this goal, the center is conducting numerous clinical trials and developing a patient database in order to prospectively study the role of genetics in aortic disease, the safety and efficacy of emerging therapies, and more. ■

For more information or to schedule an evaluation at the Aortic Center, please visit columbiasurgery.org/aortic or call 212-305-6652 or 1-844-RX-AORTA.

Peripheral Arterial Disease

Peripheral arterial disease (PAD) may be one of the most common health problems you've never heard of.

This vascular condition, which can result in the arteries to the legs and feet becoming narrowed or blocked, affects one out of five adults over the age of 55 in the United States.

Danielle Bajakian, MD, *Director of the Critical Limb Ischemia Program at the Division of Vascular Surgery and Endovascular Interventions*, explains that PAD is significantly underdiagnosed, despite a steady increase in prevalence due to rising rates of obesity and diabetes. If you or a loved one has any of the risk factors for PAD, here is what you need to know.

What causes PAD?

PAD is caused by the buildup of fatty deposits or plaques in the arteries leading to the legs.

Why is PAD a serious problem?

If the arteries become too narrowed, the extremities may not receive enough oxygen to function properly. The most



Danielle Bajakian, MD
Director, Critical Limb
Ischemia Program

common symptom is debilitating pain or cramping after walking (claudication). More severe symptoms include pain in the foot or calf at rest without walking or wounds in the toes or foot that does not heal. Other symptoms may include numbness or weakness of the leg, change in the color of the skin. In the most severe form of the disease, the toes or foot may become gangrenous (called critical limb ischemia, or CLI), and the limb may need to be amputated.

In addition to its risk to the legs, PAD also affects other organs in the body, including the heart and brain. People with PAD have a 40% increased risk of having a heart attack and stroke because blood flow to the heart and brain may be restricted. In short, a diagnosis of PAD should be considered a wakeup call to take control over one's health.

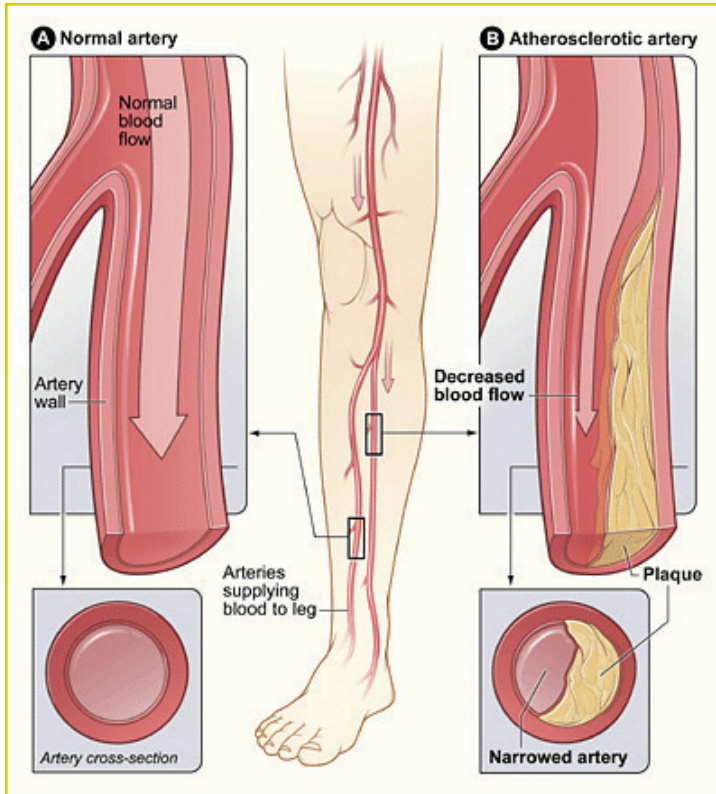
What are the risk factors for PAD?

The main risk factors for PAD include diabetes, smoking, obesity, advanced age, high cholesterol, and high blood pressure. Family history of PAD also increases a person's risk. "We can modify two of these important factors – obesity and smoking," says Dr. Bajakian. Taking steps to maintain a healthy weight can also improve type 2 diabetes, blood pressure, and cholesterol levels in the process.

What can one do to prevent critical limb ischemia?

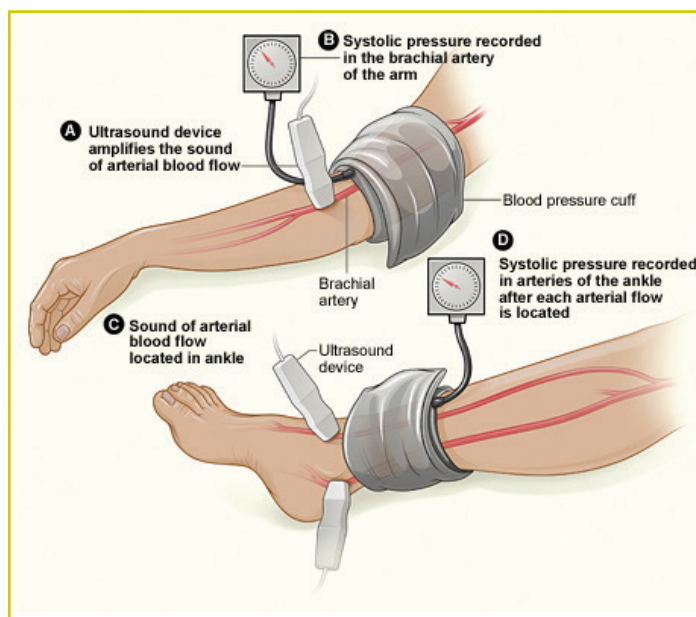
Dr. Bajakian says the importance of early evaluation cannot be overstated: if a person has risk factors for PAD, and especially if there are any symptoms such as leg pain or wounds that don't heal, he or she should see a vascular specialist. Initial evaluation can be done through a simple, noninvasive test called ankle brachial index, which compares the blood pressure in the arm to the blood pressure in the leg. This quickly reveals whether the circulation in the legs is abnormal and should lead to further evaluation by a vascular specialist. Some primary care providers now perform ankle brachial index testing in their offices.

According to Dr. Bajakian, "Early diagnosis and care is very important because it could save you from having a heart attack or stroke. There can be devastating consequences if you are diagnosed with advanced disease. But there is no harm in coming in early for evaluation if you believe you have even mild symptoms."



A: Full volume of blood flows unimpeded through healthy arteries.

B: Plaque in unhealthy arteries reduces the flow of blood to the extremities.



Noninvasive ankle brachial index testing can quickly and easily reveal whether blood pressure in the leg is abnormal.

About half of patients with PAD can be treated with lifestyle changes, exercise, and medications alone. The single most important thing a person can do to reduce complications from vascular disease is to quit smoking. For patients with diabetes, maintaining good control of blood sugar is critical. Dr. Bajakian warns that patients who have diabetes and smoke are at the highest risk of all, as they develop vascular disease at an accelerated rate compared to other patients.

How is PAD/CLI treated?

In addition to optimal management of diabetes and smoking cessation, treatment of PAD includes medications to control blood pressure and cholesterol, prevent blood clots, and to treat pain.

If these are insufficient, interventional treatments include endovascular procedures and traditional bypass operations. The most common endovascular procedure, angioplasty, is a procedure in which a catheter is threaded through an incision in the groin into the narrowed artery. A small balloon on the tip of the catheter is deployed to flatten the fatty deposits, widen the artery, and restore blood flow through the area. In some cases, a stent, or wire mesh, is placed to keep the artery open. Another option is known as atherectomy, in which a catheter is advanced into the narrowed vessel and the surgeon removes the plaque from the inside of the artery.

Endovascular procedures treat narrowed arteries with virtually no recovery period. Until fairly recently, results after endovascular procedures were not long lasting, and many patients required frequent procedures to treat their symptoms. After such procedures, restenosis, or scarring of the tissue inside the artery, would gradually cause the artery to narrow again. About 40% of patients would need to return for second procedures each year. However since 2014, medications to prevent the formation of scar tissue have been added to the stents and balloons. Studies of drug-coated devices show that results are significantly improved compared to angioplasty or stenting alone. “Data is early, but it looks very promising. We are hopeful that patients will not have to return for reoperation,” says Dr. Bajakian. “With the drug coated stents and balloons, fewer than 10% of patients have recurrent symptoms each year.”

About 80% of patients at NYP/Columbia’s Division of Vascular Surgery and Endovascular Interventions who require intervention to open blocked arteries are able to have minimally invasive endovascular procedures, but some patients still require traditional bypass operations. During bypass procedures, the surgeon creates a new route for the blood to flow, either by using a blood vessel from another part of the body, or by placing a synthetic graft. The advantage of bypass procedures is that the results last a long time, with most patients not needing to return for reoperation. In comparison to endovascular procedures, however, bypass grafting is followed by a longer recovery time. As Dr. Bajakian explains, “Bypass operations can be extremely beneficial in patients who have failed endovascular procedures.”

At NYP/Columbia, the Critical Limb Ischemia program works closely with podiatrists, endocrinologists, cardiologists, internists, and other specialists to evaluate and treat patients as early as possible.

Dr. Bajakian and her colleagues have studied many of the endovascular devices and medications now in use. Other approaches on the horizon include attempts to grow new blood vessels (angiogenesis) by injecting medications that promote the growth of blood vessels along the blocked artery. In addition to a new angiogenesis drug trial now underway, NYP/Columbia will soon begin a pivotal trial of a new drug coated stent, with Dr. Bajakian as the Principal Investigator. ■

Learn more about peripheral arterial disease at columbiasurgery.org/vascular or call 212.342.3255 to schedule an appointment.

Vascular Outpatient Lab Now Open in Riverdale



The Division of Vascular Surgery and Endovascular Interventions is now providing comprehensive vascular services at NYP/Columbia's Riverdale location (270 West 231st Street, Suite 101A, Riverdale, NY) for the convenience of patients who prefer a location outside Manhattan. This outpatient service includes office visits and treatments for the full range of vascular problems, including varicose veins, deep venous thrombosis, and carotid and aneurysmal disease.

The vascular outpatient lab is directed by Richard Schutzer, MD, who has expertise in percutaneous aneurysm repair, limb salvage, and complex vascular disease.

For more information, please call 212-932-5169

**Patients may also schedule appointments for vascular care at:
161 Fort Washington Avenue, 5th Floor, NY NY 10032
or 984 N. Broadway, Yonkers, NY 10010**

Department of Surgery Community Programs



Every year, the Department of Surgery hosts many free community programs to provide education, support, and resources for patients and families. These include events dedicated to breast cancer, lung cancer, colorectal cancer, and other conditions. Stay tuned for updates about events coming soon. These popular programs

feature presentations from NYP/Columbia faculty about the latest in diagnosis, treatment, and research. Attendees have the opportunity to ask questions and to mingle with faculty and staff. Cancer survivors are also on hand to share their experiences.

**See information about upcoming events and archived webinars at
www.columbiasurgery.org/events/community-programs**

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