Chapter 20
Peripheral Arterial Disease

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Evaluating Patient

What is the prevalence of peripheral artery disease (PAD)?	According to a 2010 estimate, there are about 200 million people worldwide living with PAD. In the United States, PAD affects about 8–12 million people, with many cases remaining undiagnosed. As of 2015 in the United States, an estimated 5,04,000 individuals (of a total estimated population of 295.5 million) were living with a major amputation due to PAD; this is a number that is projected to more than double by 2050.

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What exam techniques are used to evaluate patients for PAD?	Physical exam consists of evaluating the limb at risk for skin color changes, swelling and erythema, ulcers, wounds, and so on. It also consists of a head-to-toe evaluation of the patient looking for carotid bruit, irregular heartbeat or heart rhythm, and abdominal bruit. An ankle-brachial index (ABI) is usually the first noninvasive test used to assess PAD. It is 95% sensitive and 100% specific. It is important to remember that heavily calcified arteries have diminished compressibility, often seen in diabetics and those with end-stage renal disease, which can falsely elevate the results of the test.
How is an ABI performed and what is the interpretation of the values?	The ABI test is a noninvasive exam which is used to evaluate for PAD. A cuff is placed around the limb – usually the upper arm and ankle – and is inflated to a pressure just above the systolic blood pressure. Then, an ultrasound Doppler probe is used to locate the brachial artery in the arm and dorsalis pedis or posterior tibial artery at the level of the ankle. The cuff is then slowly deflated and the pressure when return of signals is audible is recorded. This is done on each side. The higher of the posterior tibial artery or dorsalis pedis pressures is divided by the highest brachial artery pressure to calculate the ABI. The values are as follows: 0.9 – < 1.3: Normal < 0.9 – .7: Mild PAD < 0.7 – .4: Moderate PAD < 0.4: Severe PAD
What is the Rutherford classification for chronic limb ischemia?	This is a way of classifying the symptoms of chronic limb ischemia to help determine the course of action in regard to interventions and treatment.

Category	Clinical description	Objective criteria
0	Asymptomatic – No hemodynamically significant occlusive disease	Normal treadmill or reactive hyperemia test
1	Mild claudication	Completes treadmill exercise; AP after exercise > 50 mmHg but at least 20 mmHg lower than resting value
2	Moderate claudication	Between 1 and 3
3	Severe claudication	Cannot complete standard treadmill exercise, and AP after exercise < 50 mmHg
4	Ischemic rest pain	Resting AP < 40 mmHg; flat or barely pulsatile ankle or metatarsal PVR; TP < 30 mmHg
5	Minor tissue loss nonhealing ulcer, focal gangrene with diffuse pedal ischemia	Resting AP < 60 mmHg, ankle or metatarsal PVR flat or barely pulsatile; TP < 40 mmHg
6	Major tissue loss extending above the tarsometatarsal level, functional foot no longer salvageable	Same as 5

AP ankle pressure, *PVR* pulse volume recording, *TM* tarsometatarsal, *TP* toe pressure

What is "chronic limb-threatening ischemia" (CLTI versus "critical limb ischemia" (CLI)?	According to the 2019 Global Vascular Guidelines, CLTI is a clinical syndrome defined as PAD in combination with rest pain, gangrene, or a lower limb ulceration greater than 2 weeks of duration. As opposed to CLI, which relies on a threshold ABI value for diagnosis, CLTI represents more of a continuum of disease.

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Which PAD patients are at greatest risk for development of CLTI?	In patients with known PAD, the risk for development of CLTI appears to be greater in men, in patients who have had a stroke or are in heart failure, and in patients with DM (strongest association). Patients who present de novo with CLTI (no prior diagnosis of PAD) seem more likely to be older and male and to have pre-existing cardiovascular disease (including hypertension, myocardial infarction, heart failure, or stroke), as well as renal failure.
Typically, at what ABI value in chronic limb ischemia are findings of CLTI (tissue compromise and pain at rest) present?	Below an ABI of 0.3 – 0.4. Below this level is associated with high amputation rate (30%) and mortality (25%).
When are toe pressures or toe-brachial index (TBI) utilized?	TBIs are used when tibial vessels are heavily calcified, thus providing inadequate compressibility to be analyzed by the ABI. A normal TBI is > 0.75. When suspecting CLTI, toe pressures and TBI are the preferred measures.
In addition to ankle and toe pressures, indices, and waveforms, what else should be assessed?	Additional noninvasive measurements, such as pulse volume recording (PVR), transcutaneous oximetry, or skin perfusion pressure, are used. PVR detects changes in volume of blood flow. This is measured at multiple levels along the extremity, and the magnitude and contour of PVR readings between segments is compared.

What labs should be ordered during patient evaluation?	There are many risk factors for vascular disease that can be evaluated with lab tests, including a lipid panel and fasting blood glucose. Routine blood tests such CBC, BMP/CMP, aPTT, and PT/INR may be obtained prior to angiography. Evaluating for hereditary and acquired risk factors for hypercoagulable disease can be important in certain patients to identify whether there are other reasons for vascular insufficiency.
What medical conditions may mimic arterial claudication and what must be excluded before diagnosing PAD?	Venous claudication related to DVT and venous insufficiency, neurogenic claudication, musculoskeletal pain, vascular malformations, pelvic congestion, and tumors or masses all may mimic arterial claudication. Specific inquiries about the pain should explore duration, location, progression, reproducibility with exercise, and amount of rest time necessary for symptoms to resolve. Venous, traumatic, embolic, and nonatherosclerotic etiologies should be excluded before making a diagnosis of CLTI.

High Yield History

What is angioplasty and what are the common conditions treated by angioplasty/stenting?	Angioplasty is a minimally invasive procedure where a pressure-inflated balloon is used to open a narrowed or occluded blood vessel by breaking apart any plaque in the vessel wall and stretching the vessel wall. There are many indications for stenting, and the exact reasons why the stent was placed (including progression or improvement in disease), the type of stent, location, and evident complications or in-stent stenosis as well as all interval studies and total indwell time should be documented. Stents can be uncovered, covered, self-expanding, or balloon-expandable. The type of stent placed depends on underlying anatomy and the specific indication.
What are the risk factors associated with PAD?	The most common risk factor is atherosclerosis. Other risk factors are chronic kidney disease or CKD, diabetes mellitus, tobacco use, diet, obesity, high blood pressure, and high cholesterol.
What are the characteristic clinical symptoms in patients with PAD?	Patients usually present with pain in the affected limb with exercise or walking and relief of symptoms at rest. Other characteristic symptoms include numbness and/or paresthesia, cramping, skin ulcers or gangrene, hair loss in the affected area, and weakness of the affected limb. In patients with severe disease, there is no symptom relief at rest, also known as *rest pain*. Rest pain is typically located in the mid or forefoot and can be present at all times throughout the day, and even awaken the patient from sleep.

What is the characteristic description of ischemic rest pain?	This is pain of the affected limb at rest and it represents progression of ischemia. It is made worse with elevation and is better with the limb in a dependent position. The pain is usually worse with cold exposure and better with heat exposure. It is associated with one or more of the following abnormal hemodynamic parameters: ABI < 0.4Ankle pressure < 50 mmHg Toe pressure < 30 mmHg Transcutaneous partial pressure of oxygen ($TcPO_2$) < 30 mmHg Flat or minimally pulsatile pulse volume recording waveforms
What is Leriche's syndrome?	This is the triad of buttock and thigh claudication, diminished femoral pulses, and impotence, which indicates aortoiliac occlusive disease.
Based on the described location of claudication by the patient, how may the physician localize the likely level of disease?	If confined to the calf, it is likely the superficial femoral or popliteal artery disease, though more proximal disease cannot be excluded. If it involves the thigh and calf, it is likely due to common femoral or external iliac artery disease.
What should you suspect in a young patient with PAD and no other risk factors?	Hyperhomocysteinemia. Homocysteine levels are higher in several case-control PAD cohort studies, although the benefits of folate supplementation appear to be negligible. The disease is characterized by toxicity to endothelial cells and the reduced ability to generate and release nitric oxide, arterial wall inflammation, and smooth muscle cell proliferation, as well as increased levels of plasminogen activator inhibitor.

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What is the difference between acute and chronic limb ischemia?	Acute limb ischemia is a new and sudden onset of limb pain with changes in neurological function of the said limb, in a patient who was previously not symptomatic. Acute limb ischemic changes may be superimposed on a patient with underlying chronic limb ischemia, as well.
What characteristics of the occlusion are important for understanding the outcomes of angioplasty?	The percentage of arterial stenosis and the length of the occlusion.
Describe patency of stents.	Primary patency: Time from original intervention to a second intervention, such as angioplasty, atherectomy, or thrombolysis, in which patency is restored. In other words, it is how long patency is maintained without any repeat intervention. Primary-assisted patency: Primary patency time period plus time gained from a second intervention that was required to maintain patency. This defines the durability of an intervention that failed (but not to the level of thrombosis) and required a second intervention to maintain patency. Secondary patency: Time from initial intervention to a second intervention, such as catheter-directed thrombolysis or thrombectomy, which is required to treat specifically thrombosis or occlusion. Secondary patency refers to the durability of the second intervention in this respect.
What is critical stenosis?	Critical stenosis refers to critical narrowing of a vessel which results in significant reduction in maximum blood flow to a distal area. This is the area that is usually targeted during the process of angioplasty and stenting.

Indications/Contraindications

In the field of interventional radiology, what is the most common indication for angioplasty and stenting?	Peripheral artery disease (PAD). Other indications include renal artery stenosis, central venous occlusion, and stenoses of dialysis AV fistulas or grafts.
What are the indications for intervention in patients with PAD?	Patients with critical limb ischemia or those who have moderate or severe claudication and do not respond to maximal medical therapy
Lesions with what characteristics are better treated percutaneously?	Short segment stenosis or occlusions Concentric, noncalcified stenosis Distal runoff to vessels downstream
What are some contraindications to angioplasty and stenting?	There are no absolute contraindications for angioplasty and stenting. A relative contraindication includes patients with chronic kidney disease.
What are the TASC guidelines?	The TASC II or TransAtlantic Inter-Society Consensus for the Management of Peripheral Arterial Disease are guidelines made to provide recommendations in the evaluation, diagnosis, and treatment of patients with PAD. The most utilized parts of these guidelines are the anatomical classification of the pattern of disease and guidance of revascularization strategy (open vs. endovascular) based on anatomical location and complexity of disease. The revised TASC II guidelines resulted in reclassification of more complex anatomies into less severe categories and therefore amenable to endovascular management. The classifications of lesions are as below.

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TASC A	Endovascular method with excellent results and should be the treatment of choice
TASC B	Endovascular method with good results and should be the preferred treatment unless an open revascularization is required for another associated lesion in the same anatomic area
TASC C	Open revascularization produces superior results compared to endovascular means, and endovascular treatment should be reserved for patients at high risk for open repair
TASC D	Endovascular methods do not yield good enough results to justify as the primary treatment. Open repair is preferred

What is the TASC II classification of aortoiliac disease?

TASC A	Uni-/bilateral common iliac artery stenosis Uni-/bilateral < 3 cm external iliac artery stenosis
TASC B	< 3 cm stenosis of infrarenal aorta Unilateral common iliac artery occlusion Unilateral stenosis > 3 cm or occlusion of the external iliac artery not involving internal iliac or common femoral arteries
TASC C	Bilateral common iliac artery occlusion Heavily calcified external iliac artery occlusion Bilateral external iliac artery stenosis or unilateral external iliac artery occlusion extending into the common femoral or internal iliac arteries
TASC D	Infrarenal aortic occlusion Unilateral common and external iliac artery occlusion Bilateral external iliac artery occlusion Iliac stenosis in patients needing open AAA repair Diffuse aortoiliac artery occlusive disease

Trials evaluating surgical vs. endovascular treatment of lesions, especially of TASC C and D lesions, are difficult to perform and are uncommon. Current data shows that endovascular procedures are associated with lower complication rates, shorter length of stay, and lower hospital costs than surgical management. Recent meta-analyses have demonstrated good primary and secondary patency rates of TASC C-D lesions treated endovascularly.

What is the TASC II classification of femoral-popliteal disease?

TASC A	Single stenosis < 5 cm
TASC B	Multiple < 5 cm stenosis/occlusion Single < 15 cm stenosis/occlusion not involving the infrageniculate popliteal artery Heavily calcified < 5 cm occlusion Single popliteal stenosis
TASC C	Multiple stenosis/occlusion > 15 cm Recurrent stenosis/occlusion after two endovascular interventions
TASC D	Chronic total occlusion of common femoral or superficial femoral artery > 20 cm involving the popliteal artery Chronic total occlusion of popliteal artery and proximal trifurcation

As with aortoiliac disease, enrollment in trials comparing surgical to endovascular management of femoropopliteal disease is difficult. Comparing the results of these treatments is also difficult as patients referred to endovascular therapy often have intermittent claudication, whereas those referred to surgery often have CLTI, which is associated with increased periprocedural morbidity and mortality.

Why has endovascular therapy become the primary strategy for the treatment of symptomatic PAD?	Due to many factors such as improvement in vascular testing and imaging, improvement of the technology used in endovascular treatment, and decreased length of time in the hospital and with recovery

Relevant Anatomy

What are the different levels of disease in PAD?	Aortoiliac (buttock and thigh claudication), femoropopliteal (calf claudication), and infrapopliteal (plantar claudication). Below-knee arteries typically become increasingly involved as the overall severity of disease worsens.
What layers of the arterial wall are affected by angioplasty?	There arterial wall is made of three parts. From outside in they are the adventitia, the media, and the intima. Angioplasty is considered controlled vessel wall injury. The intraluminal plaque can compress and fracture, the intima can separate, and the media can stretch. Over time, this leads to a reparative response by the vessel termed "neointimal hyperplasia," a major contributor to in-stent restenosis.

What are the major collateral pathways for lower extremity blood supply in aortoiliac occlusive disease?	They are as follows: Pathway of Winslow: Subclavian artery → internal thoracic artery → superior epigastric artery → inferior epigastric artery → external iliac artery. SMA → IMA → superior rectal artery → middle and inferior rectal arteries → internal iliac artery → external iliac artery. Lumbar, intercostal, subcostal arteries → deep circumflex iliac artery → external iliac. Lumbar, intercostal, subcostal arteries → iliolumbar and lateral sacral arteries → internal iliac → external iliac artery. Uncommon pathway can develop between the gonadal artery and the inferior epigastric artery with flow back into the common femoral artery and subsequently down the leg.
Which outflow artery is most commonly associated with intermittent claudication?	Superficial femoral artery
Which artery tends to be most diseased in patients with CLTI and infrapopliteal disease?	Popliteal and tibial arteries are more commonly associated with CLTI due to the lack of collateral vascular pathways by these lesions. Posterior tibial artery is most often diseased with relative sparing of the peroneal artery. In patients with DM, there may also be sparing of the DP artery.

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What is a persistent sciatic artery?	During normal embryological development, the axial artery regresses to the inferior gluteal artery, and the superficial femoral artery becomes the dominant artery to the leg. In 0.5% of individuals, this regression does not occur, and the axial limb artery persists as a continuation of the internal iliac artery along the posterior buttocks through the greater sciatic foramen below the piriformis muscle, into the thigh alongside the sciatic nerve eventually anastomosing with the popliteal artery. Posterior positioning makes the artery susceptible to repetitive injury and aneurysm formation, and patients may present with a painful posterior mass or distal extremity ischemia from thromboembolic disease.
What is a dominant peroneal artery?	Also known as peroneal magnus, this is when the peroneal artery is the sole main artery that continues below the knee, branching at the ankle to supply the dorsalis pedis and posterior tibial arteries. There are different forms of this anatomy with variable hypoplasia or aplasia of the anterior and posterior tibial arteries.

Relevant Materials

What is the difference between compliant and noncompliant balloons?	According to the law of Laplace, tension (hoop stress) within a balloon is equivalent to the pressure × diameter. Compliant balloons may dilate in certain areas beyond their stated diameter and can be used to mold a stent graft, for example, in the aorta. Noncompliant balloons will not dilate beyond their stated diameter, even at pressures much higher than nominal.

What is the difference between nominal and burst pressure?	Nominal pressure is the insufflation pressure required for the balloon to reach its stated diameter. Burst pressure is the pressure at which 99.9% of balloons will not rupture with 95% confidence.
What is the difference between "over-the-wire" and monorail balloon delivery systems?	In an over-the-wire system, the guidewire enters the balloon catheter and remains in the catheter along the entire length of the balloon, exiting at the distal catheter opening. This system has good pushability, though is prone to loss of wire positioning during balloon removal. In the monorail system, the guidewire enters the balloon catheter but exits the catheter through a side port of the balloon catheter. This system is less pushable, though allows for more rapid wire exchange.
What two types of stent configurations are available?	Balloon-expandable and self-expandable stents. Either stent can have open (flexible) or closed (less flexible, less risk of plaque protrusion) cell design, and either stent can be covered or uncovered.
Where are they commonly used?	Balloon-expandable stents are stiff with high radial strength to avoid vessel recoil, which make for good use in a vessel with a calcified ostial lesion. These stents are sized 1:1 to the vessel and need a balloon to be properly deployed. Self-expandable stents have high elasticity and shape memory with low radial force, meaning they are more flexible and are usually placed in tortuous vessels or those which may experience movement such as the iliac and femoral arteries. Self-expandable stents should be slightly oversized by approximately 10–15%. Balloon-expandable stents are not suited for anatomical areas of flexion as this can lead to permanent crushing of the stent.

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What is a drug-eluting stent?	Drug-eluting stents may contain polymer (Eluvia; Boston Scientific) or polymer-free (Zilver PTX; Cook Medical) coating containing a chemotherapy drug, paclitaxel, which is an antimitotic agent. The rationale for drug coating is to help prevent the process of neointimal hyperplasia and in-stent restenosis and improve patency of stents. It is important to remember that neointimal hyperplasia is reparative response of the artery to angioplasty, and while it contributes to in-stent restenosis, it is actually protective against platelet aggregation. Therefore, dual antiplatelet therapy following these procedures is very important.

General Step by Step

What is the preferred access site for PAD treatment?	The choice of access is variable and dependent on disease location and extent, coexisting iliac and femoral disease, and plaque morphology. Depending on the planned treatment, access can be unilateral or bilateral, ipsilateral or contralateral, or even be approached from the upper extremity (axillary, brachial, radial). Traditionally, retrograde femoral artery access is most common and is most safely performed under ultrasound and fluoroscopic guidance over the level of the femoral head.

What is the next step after gaining arterial access and placing a sheath?	This is to connect the sheath to a continuous drip of heparinized saline and use a wire to gain access to the true lumen of the vessel across the lesion to be treated. Occlusions may require hydrophilic wires and angled braided catheters for directional change. Heparinized saline is given to prevent clot formation which can break up and flow downstream causing new, distal vessel occlusion.
What is vessel preparation?	Operators may choose to "prep" the vessel with atherectomy to decrease the amount of disease in the vessel prior to angioplasty and stent placement, which can help in enhancing the effects of angioplasty, reducing the chances for dissection, and improve luminal gain and drug delivery from stents. There are many atherectomy devices available, as well as protective devices for distal embolization, which can be used concurrently to trap any dislodged clots.
What if I can't cross an occlusion or my wire enters the subintimal space?	Sometimes, plaque morphology favors approach from the opposite direction, so retrograde access beyond the lesion may be considered. If planning stent placement, reentry devices are available to bypass the lesion in the extra-intimal space and then reenter the true lumen beyond the level of disease.
What do I do after I deploy a stent?	Balloon angioplasty can be performed after deploying self-expanding stents to promote good wall adherence. Postprocedural angiography should be performed at the level of the disease to ensure good inline flow, as well as in the distal extremity to document any improved flow or distal capillary blush.

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What is a closure device?	Manual pressure above the arteriotomy site can be utilized to achieve hemostasis, typically for 10–15 minutes or even longer in an anticoagulated patient. Closure devices are tools that can deposit thrombogenic material on top of the arteriotomy site or introduce a suture to close the arteriotomy, which helps in achieving hemostasis. These tools should be supplanted by manual pressure and close observation for possible incorrect deployment or device failure.

Complications

Aside from access complications, what complications can occur during an endovascular procedure?	Remember that angioplasty is controlled vessel injury and there is always a risk of vessel wall rupture and/or dissection, which may be visualized as a dissection plane or extraluminal contrast extravasation. Procedural pearls are to never lose wire access across a lesion and always have a balloon and covered stent available to tamponade bleeding. The most common complication is distal occlusion secondary to emboli from an atherosclerotic plaque. Other complications are distal occlusion secondary to emboli from an atherosclerotic plaque or new clot, which can form during the procedure if heparinized saline fails to run through the vascular sheath.
What are some more late-term complications?	Stent fracture, stent migration, and stent collapse.
How do you monitor for acute complications?	Evaluation of the puncture site, femoral, and distal pulses should be checked routinely during the immediate post-op period and daily until the patient is discharged from the hospital.

What are the complications that can occur at the puncture site?	Dissection, thrombosis, pseudoaneurysm, and fistula.

Landmark Research

What was the goal of the PARC study?	The PARC study was designed to address the lack of standardized definitions in the field of lower extremity peripheral artery disease research. The Peripheral Academic Research Consortium (PARC), the US FDA, and the Japanese Pharmaceuticals and Medical Devices Agency joined forces to develop a set of definitions for clinical characterization and treatment options to be used by clinicians, researchers, and medical device developers.
What are some things that were defined by the PARC study?	The study helped define patient symptoms according to already existing classification systems – the Fontaine and Rutherford systems. Other definitions were established in the following categories: Anatomy, including characteristics of lesions and vessels Acute procedural outcomes Clinical outcomes Imaging and physiologic surrogate endpoints
Why were these definitions important?	They are important because it helps classify patients into groups that be easily followed in research when evaluating new therapies as well as continued improvement of existing treatment options. It allows for all parties involved in the diagnosis and treatment of PAD to have a common language, allowing research in this field to grow.

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What is the INPACT trial?	The IN.PACT SFA trial was a prospective multicenter randomized controlled trial that involved 331 patients to compare drug-coated balloon (DCB) angioplasty with traditional percutaneous transluminal angioplasty (PTA) in the treatment of superficial femoral artery (SFA) and proximal popliteal artery disease. There were many other clinical trials that addressed similar goals, including the LEVANT and the RAPID trials; however, the INPACT trial was the largest prospective, multicenter, randomized trial.
What are the results of the INPACT trial?	The IN.PACT SFA trial showed that DCB was superior to PTA in improvement of patient outcomes for peripheral arterial disease and that they had a favorable safety profile when treating femoropopliteal arterial disease.
How were the results demonstrated in functional outcomes?	Functional outcomes for both investigational and control groups were unchanged from baseline in terms of quality of life. Both groups also demonstrated improvement from baseline in terms of walking impairment in a period of 12 months; there was no statistical difference in both groups.
So then, how are DCBs more effective than PTAs?	Three- and five-year data shows patients that underwent DCB had better primary vessel patency and a marked reduction for revascularization and retreatment of the target lesion. This means that DCBs were able to keep areas of critical stenosis open longer and reduced the need for retreatment of the area down the road. Although functional outcomes were similar across both groups, DCB proved to be safer and with less complications.

Common Questions

What is the pre-procedure status for a patient?	Patients should not eat or drink anything at least 4–6 hours before their procedure. Patients who take medications should discuss with their doctor which medication can and cannot be taken the day of the procedure and, also importantly, when certain medications can be stopped and resumed after the procedure.
Why is patient follow-up important?	It is important to monitor results of the intervention performed and to prevent further disease progression.
Is there a standardized imaging technique or protocol when it comes to patient follow-up?	There has not been much vigorous research and trials in regard to the timeline for patient follow-up and what imaging study should be used to evaluate the patient. There is an agreement that the same imaging modality should be used when following patients to have stable comparisons.
What is the modality of choice for imaging follow-up?	The modality of choice for follow-up is ultrasound. There are many advantages to this modality such as being noninvasive, low cost, wide availability, and lack of radiation. The major disadvantages are its operator dependent and artifacts on imaging which can happen with calcifications and stents.

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What other modalities are used for follow-up?	Other imaging modalities include computer tomography angiography or CTA and magnetic resonance angiography or MRA. CTA is a noninvasive imaging modality that is widely available, is not significantly operator dependent, can be rapidly performed, and can accurately evaluate the complications of PAD intervention. Disadvantages of CTA are ionizing radiation and the risk of contrast-induced contrast injury. MRA is another noninvasive imaging modality that can be used to evaluate PAD interventions. Limitations include artifacts such as susceptibility and flow-related.
What are some important actions after a procedure is done?	Patients are usually advised and encouraged to stop smoking. Patients are also started on antiplatelet therapy; most patients are started on aspirin and Plavix. Patients are also encouraged to exercise and eat healthy food. These are just as important as the procedure in ensuring long-term success.
When should a person be seen for clinical follow-up?	Patients are usually seen in clinic for the first time 1 month after their intervention. Imaging should have been done before the visit. A good history and physical should be performed including examination of the affected extremity.

Further Reading

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