Access & Closure in Practice

Experts from a variety of specialties answer questions about their daily choices in vascular access and closure.

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ACCESS

What was your training in vascular access?

During my traditional cardiology fellowship, I was trained in the typical modified Seldinger femoral approach. I then did further training on open brachial arteriotomy procedures. Over the years, I have utilized many vascular beds for access, and my colleagues and I reported the first percutaneous pedal access for tibial wire placement.

What type of algorithm do you follow in deciding on an access strategy?

Lower extremity and aortic procedures are typically done from the common femoral arterial access site, although, less commonly, popliteal or tibial/pedal access is also used. Renal intervention is usually performed from the femoral access, with some use of brachial or radial access. Carotid interventions are primarily accessed via the femoral approach, with an occasional brachial access. Subclavian intervention is probably evenly divided between brachial and femoral access. I take into consideration tortuosity and, if known, the level of aortic pathology that may be present.

There is a strong push to use radial access more often, but many of the peripheral devices are not long enough to reliably reach the lower extremity. There are some early data showing an acute bleeding reduction and a possible early mortality benefit in myocardial infarction procedures when radial artery access has been utilized. Personally, I believe that we should individualize our choices for access and focus on reducing complications for all access sites. Although I performed my first cardiac procedure from the radial artery more than 10 years ago, I think we need more prospective data evaluating the long-term effects of sheaths in this small artery before justifying the current large-scale initiative to change over to radial artery access. My partner Dr. Steven Yakubov authored one of the first publications on thrombolytic treatment for hypothenar hammer syndrome years ago, and thus, I may be more sensitive to the recent presentation of prospective data at the American College of Cardiology's 2011 annual scientific session by Dr. Dierk Scheinert showing unexpectedly high rates of symptomatic closure of the radial artery. This trial appeared to be unique in that it used more accurate, noninvasive imaging and detailed patient questionnaires.

When accessing tibial lesions, do you prefer antegrade or retrograde access?

Evaluating a patient for antegrade versus retrograde access during tibial procedures is affected by several variables. Certainly, body habitus is the single biggest variable that affects my decision. Antegrade access is associated with better wire control and lower operator radiation exposure. However, an obese patient is such a challenging antegrade puncture that I will typically use contralateral femoral access for patients with significant pannus. An alternative antegrade approach is to use ultrasound and gain access in the superficial femoral artery. I restrict this to patients with at least a 6-mm femoral vessel.

Another variable is the complexity of the tibial intervention. For long chronic total occlusions or occlusions without clear proximal segments to cannulate, I will typically opt for antegrade access so that I have the optimum wire control. The distance to the lesion (ie, distal tibial or pedal intervention or length of available device) may guide me to antegrade access as well.

Interestingly, the time of day may also influence my decision. Antegrade patients are observed for a longer period of time postprocedure. Because I tend to try to keep these procedures outpatient oriented, I may use contralateral femoral access later in the day.

What is the most common access site complication you see in your practice? Is it preventable? What do you do to minimize its occurrence?

Hematoma is the most common access site complication. I really feel that, to a large degree, this is very preventable. My personal belief is that this typically occurs because we used too large of a needle for vascular access. Downsizing to a smaller access needle from the vascular access micropuncture kits that are available from various vendors decreases the caliber of inadvertent vascular structure punctures such as the back wall, side branches, and veins. I also typically use fluoroscopy to make sure that I am in correct anatomic position, especially in the obese patient. I truly believe that the best closure starts with the best access. I also think that many physicians do not concentrate enough on entering the front wall of the vessel. Oftentimes, physicians angle in from the side of the vessel. Both manual pressure and closure devices are optimized with front wall arteriotomy.

What is the most important lesson you have learned in proper vessel access techniques?

Know for sure where you are and do not struggle. I have watched others and myself through the years struggle with finding the vascular structure on certain patients. Certainly, patients who are obese, have significant calcification, or have scar tissue from previous groin surgery or multiple percutaneous procedures can be challenging. Fluoroscopic guidance and external ultrasound can make a difficult case easy.

In what ways should venous access be performed differently than arterial?

I usually use a micropuncture needle and, often, external ultrasound. This is especially true if the patient may receive thrombolysis and groin bleeding is a significant risk.

Do you use ultrasound guidance or just feel for pulse during access? When do you use one or the other?

I use fluoroscopy and then reconfirm with bony palpation to make sure I know where the inguinal ligament is positioned. External ultrasound is utilized for larger patients, antegrade puncture, or those with scarred groins to decrease time and effort.

What is one device modification that would help to optimize vessel or lesion access?

If we had a simple stud (maximum pulse) finder for the body, it would help, but so far, I have not seen one.

CLOSURE

Do you primarily use manual compression, assisted compression, or vascular closure devices in standard peripheral interventional cases?

I use vascular closure on every case I can. However, I do not consider any closure device to be instantaneous. I wish we called them "assisted closure devices." All of my patients have some compression for a few minutes after closure device placement and have a very low risk of late bleeding.

Which factors have most contributed to your decision in closure methods? What are the most significant pros and cons of manual compression and closure device use in your opinion?

Variables that I consider when choosing a method of closure include body size, amount of subcutaneous tissue, vessel size, vessel disease and calcification, anticoagulation level, the patient's mental status and ability to follow instructions, and finally, blood pressure.

Manual compression is barbaric and very dependent on the individual applying compression. I like to have more personal responsibility because this is the major source of percutaneous procedural complications.

Which patients are not well suited to having a closure device used?

These patients include those who have an active infection, small vessel along with lack of subcutaneous tissue, > 50% stenosis at the puncture site, or inadvertent access through a side branch or vein.

What is the role of ultrasound guidance in closure device use? In which patients do you use it?

I do not use this technique. I would rather use it to achieve appropriate access.

Do you primarily use only one closure device, or do you select from a variety based on the specific characteristics of the case?

I have used or tried most of the available devices.

How quickly do you aim to have your patients ambulating, both for manual compression and closure device use?

Ambulation times are less important to me than the patient's comfort level and lack of complications. Other

considerations are how much inflammation a device may be associated with. Many patients undergo more than one procedure, and I like to minimize scar formation as much as possible. That being said, I typically ambulate my diagnostic patients within 1 to 2 hours and interventional patients within 3 to 4 hours.

Do you use closure devices for antegrade procedures?

Although this is an off-label use, I think this achieves better hemostasis. I have used most of the traditional devices for this and, currently, try to stay extravascular or utilize suture-mediated closure.

How do you obtain hemostasis for large-bore devices?

I use the preclose technique with suture-mediated closure. Here again, patient selection and proper access is important for dependable results. I usually size the vessel with external ultrasound to make sure that there is an acceptable vessel. The selection is influenced by size, level of calcification, and disease presentation. I make sure we are entering the front wall of the artery with ultrasound as well. ■

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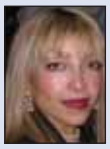

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ACCESS

What type of algorithm do you follow in deciding on an access strategy?

The vast majority of peripheral vascular interventions (including carotids) in my practice are performed via a percutaneous femoral artery approach. The common femoral is a forgiving access site as a result of good caliber (generally) and easy compressibility should the closure device fail. Retrograde access for iliac lesions and antegrade for infrainguinal interventions is the general rule. If there are known bilateral iliac occlusions, imaging is performed via a left brachial ultrasound-guided access (4 F) with a pigtail catheter positioned at the aortic bifurcation to provide roadmapping for iliac recanalization (via bilateral retrograde femoral access).

Of course, one would wish to avoid right brachial or radial access whenever possible, because a catheter inserted from such an approach inevitably crosses the right vertebral and the brachiocephalic trunk—risking embolization to the whole of the right fore and hindbrains.

For renal and mesenteric work, sometimes a brachial approach is elected if, for example, on previous overview imaging (magnetic resonance angiography, computed tomographic angiography), the angles at the ostium of the relevant aortic branch vessel are oriented steeply caudally. The geometry of the anatomy under these circumstances often precludes effective recanalization from a femoral route.

In my practice, radial and axillary accesses are almost never utilized/necessary. Occasionally, a brachial approach is chosen for bovine arches during carotid access or in the setting of a short common carotid artery. A novel guiding catheter (Piton GC, Medtronic Invatec, Frauenfeld, Switzerland) via a femoral approach makes a brachial approach in difficult arch anatomy unnecessary.

When accessing tibial lesions, do you prefer antegrade or retrograde access?

I prefer antegrade femoral, routinely using ultrasound guidance. At least 5% of patients have variant anatomy at the femoral level, and in using the landmark technique, one simply cannot predict anatomic complexity. Furthermore, as the vast majority of peripheral vascular interventions in my routine practice undergo assisted closure, it is important to be confident that one has not punctured an atheromatous and/or calcified plaque at the femoral level. Ultrasound elegantly displays variant anatomy and pathology at the puncture site. Occasionally, if an antegrade femoral approach has been unsuccessful in recanalizing tibial occlusions, a retrograde distal tibial approach can be useful, snaring the 0.014-inch wire subsequently from an antegrade femoral approach and working through the femoral puncture.

In obese patients, there is an argument for working from the contralateral femoral, via a retrograde puncture, with the placement of an "up-and-over" sheath

over the aortic bifurcation. This is sometimes appropriate, but the "action" is remote from the puncture; there is a general loss of pushability and one-to-one torque, and any iliac tortuosity renders the interventional conditions relatively hostile. Direct antegrade ultrasound-guided access into a disease-free portion of the proximal superficial femoral artery is often a useful approach under these circumstances.

What is the most common access site complication you see in your practice? Is it preventable? What do you do to minimize its occurrence?

Our rate of hematoma is currently around 2% (relatively infrequent due to the liberal use of closure devices), occurring most often in obese patients or those with calcified femoral arteries or scarred groins. Due to routine use of Perclose/ProGlide (Abbott Vascular, Santa Clara, CA) for carotid stenting procedures in our institution (9-F punctures for Mo.Ma flow arrest [Medtronic Invatec] or Gore flow reversal systems [Gore & Associates, Flagstaff, AZ]), there have been no clinically relevant hematomas (extending length of stay or requiring surgical intervention), despite the exacting antiplatelet and anticoagulant regimens that these procedures mandate.

What is the most important lesson you have learned in proper vessel access techniques?

Use ultrasound guidance. It passes the "Mom" test. In other words, what would you prefer for your mother, or yourself, for that matter?

In what ways should venous access be performed differently than arterial?

With ultrasound guidance. It may be a matter of machismo to plow ahead using landmark techniques to "identify" a pulseless vessel, but operators know that striking a glancing blow at the vein will make it "cower," causing spasm and increasing the level of difficulty for further attempts. Furthermore, sustained pressure with an access needle is to be avoided, because it simply results in compression of the lumen of the vein and apposition of anterior and posterior vein walls; rather, stabbing motions are much more likely to result in successful access.

Do you use ultrasound guidance or just feel for pulse during access? When do you use one or the other?

I employ routine ultrasound guidance for any procedure that requires access to a vessel. It is cost effective (requiring a vascular access ultrasound unit with limited specification with the additional per-case cost of only a sterile sleeve to be placed over the probe), facilitates successful access at first attempt, and passes the Mom test. Despite a notable exception, at my institution, the differences in attitude toward ultrasound-guided access would appear to be generational. In other endovascular/interventional environments, the differences may hinge on operator specialty.

What is needed to help optimize vessel or lesion access?

Dedicated training is needed in ultrasound-guided access for fellows in interventional radiology, interventional cardiology, interventional neuroradiology, and vascular surgery.

CLOSURE

Do you primarily use manual compression, assisted compression, or vascular closure devices in standard peripheral interventional cases?

I routinely use vascular closure devices.

Which factors have most contributed to your decision in closure methods? What are the most significant pros and cons of manual compression and closure device use in your opinion?

I use closure devices because of early ambulation, facilitation of day-case work, and peace of mind. We all have had cases that involved near exsanguination in frail, elderly patients nursed on remote wards or single rooms after antegrade femoral puncture and manual compression of the puncture site that have been identified when it was almost too late.

Which patients are well suited to having a closure device used?

I would argue that it is almost always worth trying, if one elects to use a closure device that does not rely on an intraluminal component. The StarClose device (Abbott Vascular) is ideally suited for such indiscriminate use. If the device fails, the operator simply has to resort to manual compression because the device does not rely on an intraluminal plug or transarterial suture to effect closure.

Which patients are not ideal candidates?

Morbidly obese patients (who are, of course, also at elevated risk after manual compression) and those with surgically scarred groins. Our institution has had reassuring results after using the StarClose[1] or Perclose ProGlide systems in antegrade puncture, hypertensive patients, and in those on dual-antiplatelet therapy or after thrombolysis.

What is the role of ultrasound guidance in closure device use? In which patients do you use it?

Secure closure requires secure access into a relatively undiseased portion of the common femoral artery (and not the external iliac, or the profunda femoris, which can easily result from reliance on "landmark" techniques).

Do you primarily use only one closure device, or do you select from a variety based on the specific characteristics of the case?

In my practice, the device is chosen primarily as a function of the French size of puncture to be closed and because, if appropriate to the puncture-site hole, one would intuitively wish to avoid an intraluminal component that may (1) become the nidus of thrombus and result in thromboembolic complications, (2) be associated with late stenosis, and (3) limit repeat puncture in accordance with strict timelines.

How quickly do you aim to have your patients ambulating, both for manual compression and closure device use?

This depends on the size of the puncture-site wound. Four-French punctures at my institution are generally subjected to manual compression because use of most of the available devices would necessitate upsizing of the puncture-site wound. These patients are expected to have 4 hours bedrest. Any puncture of 5-F and above is usually subjected to assisted closure, and for either StarClose or Perclose ProGlide, our patients sit up at half an hour and can mobilize (for iliac/infrainguinal interventions) after 1 hour if we are confident that the closure device has worked. For carotid stents, although we are generally convinced of secure closure (Perclose ProGlide), blood pressure issues may delay mobilization but not the ability to sit erect at half an hour and have a nice cup of tea and some toast. ■

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1. Williams RE, Angel CY, Bourkaib R, et al.Multicenter safety and efficacy analysis of assisted closure after antegrade arterial punctures using the StarClose device. J Endovasc Ther. 2007;14:498-505.

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ACCESS

What type of algorithm do you follow in deciding on an access strategy?

I generally prefer to use a contralateral retrograde approach whenever possible because access is usually easier to achieve. However, specific circumstances or lesions will dictate a specific type of access. In dealing with distal external lesions, I usually come up and over; otherwise, the sheath will be in the way from an ipsilateral approach. Proximal superficial femoral artery lesions will prevent ipsilateral antegrade approaches. Distal tibial lesions in a tall patient often require an ipsilateral antegrade approach. Finally, aortic bifurcation issues, such as kissing stents, modular endografts, or aortobiiliac/bifemoral grafts, can prevent up-and-over techniques. It is important to remember that brachial access can be very helpful in some of these circumstances.

When accessing tibial lesions, do you prefer antegrade or retrograde access?

I prefer an antegrade approach. It is easier to reach the lesion and treat it without losing the wire. There is also better directional torque along the wire in the antegrade approach.

What is the most common access site complication you see in your practice? Is it preventable? What do you do to minimize its occurrence?

Pseudoaneurysms are the most common complication. For the most part, it is preventable, but occasionally, it still does occur. Risk factors include obesity, previous hip replacement, calcified vessels, and abnormal anatomy. Simple, yet not always obvious, reminders should be given if someone else is pulling the sheath, especially if that person is inexperienced. For example, in an antegrade stick, pressure should be held in a more caudal position because the arterial puncture will likely be caudal to the skin puncture.

What is the most important lesson you have learned in proper vessel access techniques?

The most important lesson is not to stick high. The

inguinal ligament traverses from the anterior superior iliac spine to the pubic tubercle. The needle should not go above this anatomic boundary. Furthermore, when introducing the needle, it should be at an approximate 70° angle. If the angle is too acute, the needle will enter the artery much more cephalad than where it enters the skin, increasing the risk of a retroperitoneal stick. Finally, it is important to use fluoroscopy to ensure that the access is at the femoral head for puncture of the common femoral artery.

In what ways should venous access be performed differently than arterial?

Similar techniques are used for venous puncture. That being said, there is more room for error because it is a low-pressure system and will usually stop bleeding with even slight and short periods of pressure.

Do you use ultrasound guidance or just feel for pulse during access? When do you use one or the other?

I almost always just feel for the pulse. I rarely use ultrasound unless I am unable to palpate a pulse.

What is one device modification that would help to optimize vessel or lesion access?

A sheath that could be reversed from antegrade to retrograde or vice versa would be helpful.

CLOSURE

Do you primarily use manual compression, assisted compression, or vascular closure devices in standard peripheral interventional cases?

I primarily use manual compression.

Which factors have most contributed to your decision in closure methods? What are the most significant pros and cons of manual compression and closure device use in your opinion?

The main benefit of manual compression is that nothing is left behind. It allows for a relatively "clean" vessel and decreases the difficulty if operative exposure is needed. Furthermore, there is extremely low risk of vessel thrombosis and no risk of distal embolization of foreign material. The downside is that pseudoaneurysms can occur if appropriate pressure is not applied. Furthermore, the patient must remain recumbent for a longer period of time.

How quickly do you aim to have your patients ambulating, both for manual compression and closure device use?

With manual compression, we wait 4 to 6 hours after removing an arterial sheath. ■

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ACCESS

What type of algorithm do you follow in deciding on an access strategy?

Femoral access is my first choice. In patients with aortofemoral bypass or an aortic stent graft, I will revise the access and may use an ipsilateral femoral or antegrade puncture for infrainguinal lesions or use a brachial approach. Rarely anatomic and technical difficulties would cause me to change from femoral to brachial. I have no experience with radial, although I think there are some indications in the upper abdomen. Very rarely do I use a popliteal or tibial approach for below-the-knee or superficial femoral artery (SFA) occlusions.

When accessing tibial lesions, do you prefer antegrade or retrograde access?

We use mostly retrograde because fellows start all of the cases, but I personally prefer the antegrade approach.

What is the most common access site complication you see in your practice? Is it preventable? What do you do to minimize its occurrence?

Hematoma after compression: it is preventable with good compression or use of closure devices combined with slight compression.

What is the most important lesson you have learned in proper vessel access techniques?

Always locate the femoral head and the inguinal ligament.

In what ways should venous access be performed differently than arterial?

This depends on the indications and location of the venous access. For example, a vein access to the internal jugular for a tunneled catheter is performed differently than for an inferior vena cava filter placement. Also, in venous puncture, one should pay attention to inadvertent arterial puncture. We tend to use a micropuncture needle for the arterial access and a thin-wall needle for the venous puncture.

Do you use ultrasound guidance or just feel for pulse during access? When do you use one or the other?

We use ultrasound for accessing the vessels in most patients. In emergency cases such as trauma or unstable patients, I usually do not use ultrasound.

What is one device modification that would help to optimize vessel or lesion access?

Better closure devices or plugs for the nonvascular access in areas with high risk of bleeding, such as liver biopsies, would be useful.

CLOSURE

Do you use primarily manual compression, assisted compression, or vascular closure devices in standard peripheral interventional cases?

More and more, we are using vascular closure devices.

Which factors have most contributed to your decision in closure methods? What are the most significant pros and cons of manual compression and closure device use in your opinion?

Rapid mobilization and the use of anticoagulation have led me to use more vascular closure devices. For manual compression, there is less risk of vessel damage or distal embolization, which represent the cons of the closure device. Cost is another factor against closure device use. Immobilization, hematoma, and bleeding are some of the cons of manual compression.

Which patients are well suited to having a closure device used? Which aren't ideal candidates?

Patients under anticoagulation, older patients, and those who can't stay still for a couple of hours are good candidates. In obese patients, some devices can be useful. Patients with calcified vessels and small ves-

sels are not ideal, and there are fewer benefits of using closure devices in younger patients.

What is the role of ultrasound guidance in closure device use? In which patients do you use it?

In my practice, the role of ultrasound guidance in closure device use is no different from using ultrasound for access.

Do you primarily use only one closure device, or do you select from a variety based on the specific characteristics of the case?

I generally use one device, but we do try new devices if they are available. We most often use Angio-Seal (St. Jude Medical, Inc., St. Paul, MN), but more and more, we are using the Mynx closure device (AccessClosure, Inc., Mountain View, CA).

How quickly do you aim to have your patients ambulating, both for manual compression and closure device use?

This varies based on the size of the sheath and coagulation. For 4- to 6-F sheaths with manual compression, our goal is 4 hours. For anything greater than 6 F with manual compression, we aim for 6 hours. With closure devices, we expect our patients to ambulate between 1 to 2 hours. ■

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ACCESS

What type of algorithm do you follow in deciding on an access strategy?

The first thing I consider is the suspected or known lesion location. Contralateral retrograde femoral access is my standard approach to lower extremity lesions from the distal common iliac artery and down, whereas proximal iliac lesions are more easily treated from an ipsilateral femoral approach.

Certain circumstances can make access decisions more challenging. A heavily calcified or very acutely angled aortic bifurcation can present a challenge when trying to pass a sheath "up and over" to the contralateral side. Previous aortobifemoral bypass or endovascular aneurysm repair (excluding, perhaps, the Powerlink stent graft [Endologix, Irvine, CA], which lacks a "flow-divider") can also prohibit a contralateral approach. Ipsilateral antegrade or brachial access may be the better approaches in these cases.

If lesions are very distal in the tibial vessels, length of wires and catheter must be considered when deciding on brachial approach. I will often access very high in the arm—almost to the axillary artery—to help with this. The antegrade femoral approach is another option if the proximal SFA is disease free. If tandem lesions are present in the proximal iliac arteries and in the infrainguinal vessels, I will try to treat the distal lesions first from a contralateral approach if I can get a sheath through the diseased iliac vessels. I will then treat bilateral iliac arteries from a bilateral retrograde femoral approach. This way, if kissing stents must be placed, I haven't excluded myself from being able to access the distal lesions from my preferred contralateral groin approach.

Brachial access is a good option for mesenteric lesions due to the acute downward angle of these vessels and can also be considered for the retrograde approach to very proximal subclavian lesions. I generally try to avoid brachial access in petite women due to the potential access complications in this group unless there is no other good option. When accessing the brachial artery, I generally stick higher toward the axilla as opposed to the antecubital area because the artery has a larger diameter more proximally. Another personal rule for brachial access is to always use a micropuncture kit for initial access. Open exposures for access should never be discounted, especially for antegrade approach in the legs when proximal SFA or common femoral lesions exist with more distal lesions that would be amenable to endoluminal therapy. In these cases, concomitant proximal endarterectomy may be performed before establishing sheath access for more distal lesions. I have also used infraclavicular axillary artery cutdowns with or without a conduit to accommodate larger sheaths from an arm approach. A good example of this is for antegrade hypogastric artery Viabahn endoprosthesis (Gore & Associates, Flagstaff, AZ) placement for hypogastric preservation during "Brazilian snorkel" endoluminal aneurysm repair procedures.

When accessing tibial lesions, do you prefer antegrade or retrograde access?

I usually prefer retrograde access unless there is a concern that my wires or catheters may not reach a very distal lesion.

Antegrade access eliminates this concern. Some operators find antegrade access to be awkward and cumbersome, but it can be an extremely valuable option in some cases.

What is the most common access site complication you see in your practice? Is it preventable? What do you do to minimize its occurrence?

We are not infrequently consulted for bleeding complications, such as hematomas and pseudoaneurysms, after arterial access procedures. These are known complications of arterial puncture, but the risks can be reduced by ensuring access location is appropriate (eg, not above the inguinal ligament where compression can be extremely difficult), sheath removal, and compression at the end of a case is adequate, and the operator is familiar and skilled with any closure device he or she might be using. Use of a closure device certainly does not guarantee freedom from complications, especially if used incorrectly or in the wrong vessels.

What is the most important lesson you have learned in proper vessel access techniques?

I always use ultrasound guidance for arterial access in the arm, no matter how easily palpable the pulse may be. I learned this lesson in fellowship training after treating a patient with a severe median nerve injury after a brachial artery puncture. Ultrasound guidance helps visualize needle entry directly into the artery without rolling to one side or the other where nerve injury can occur.

In what ways should venous access be performed differently than arterial?

I always use ultrasound guidance for jugular vein or arm vein access. In the groin, I often see residents trying to access the common femoral artery at the groin crease, which is almost always too low and will end up going into the superficial femoral artery. Knowing your landmarks for the inguinal ligament is crucial. Whereas the arterial puncture should usually be higher than the groin crease, I direct femoral vein access at the level of the groin crease. As the artery and vein travel beyond the inguinal ligament, they run in a more side-to-side course than an overlapping one, as they often seem to do more proximally.

Do you use ultrasound guidance or just feel for pulse during access? When do you use one or the other?

For femoral access, I use palpation, as most operators probably do. As mentioned, I always use ultrasound guidance for arm access (arterial or venous), jugular vein access, popliteal vein access, and any other access that I have difficulty with using palpation alone. A bedside ultrasound machine can be a priceless tool for any operator attempting vascular access.

What is one device modification that would help to optimize vessel or lesion access?

Lesion access can be optimized if devices are smaller profile, thus requiring smaller sheaths.

CLOSURE

Do you use primarily manual compression, assisted compression, or vascular closure devices in standard peripheral interventional cases?

I used to use manual compression for more than 90% of my cases. With much improved closure device options available now, I have changed my practice to consider closure for almost any access > 5 F. This includes totally percutaneous EVAR now as well. In all cases, though, patient selection is crucial to successful closure.

What are the most significant pros and cons of manual compression and closure device use in your opinion?

Manual compression is the most natural means of hemostasis relying on inherent biological mechanisms. It eliminates the rare risks of embolization, thrombosis, or infection of the closure device material. Closure, on the other hand, reduces the time of bed rest and, when used appropriately, can be very effective in achieving immediate hemostasis and preventing bleeding complications. Another important caveat to closure device employment is the need to become familiar and appropriately trained in using it.

Which patients are well suited to having a closure device used? Which aren't ideal candidates?

I consider closure in patients who do not have severely calcified or extremely small-diameter access arteries. I also want to make sure the patient is not going to need surgical exposure of the artery in the very near future. Dissecting out and extracting a closure device from a common femoral artery on someone who needs a bypass can be quite a nuisance. I do not use a closure device in upper extremity arteries or if groin access proves to be below the femoral bifurcation. Other patients who may significantly benefit from closure are those who have a difficult time lying on their backs for prolonged periods during bed rest after a case and those who may need to be on full anticoagulation immediately after a procedure.

What is the role of ultrasound guidance in closure device use?

When using a closure device, no matter which device, it is crucial to make sure your access is within the common femoral artery and not below this level. I use the patient's physical landmarks and fluoroscopic guidance when obtaining groin access. However, ultrasound is another excellent option to ensure you're accessing the artery in the appropriate location. This is with the

assumption that the operator is comfortable using ultrasound and able to identify the vessels of concern.

Do you primarily use only one closure device, or do you select from a variety based on the specific characteristics of the case?

I have used (and explanted) many different closure devices. In the past, I mostly chose between StarClose (Abbott Vascular, Santa Clara, CA) and Angio-Seal (St. Jude Medical, St. Paul, MN) depending on patient characteristics. Currently, my preference is the Perclose ProGlide device (Abbott Vascular). As a surgeon, I feel that suture closure is the next best repair of an artery after natural hemostatic mechanisms.

How quickly do you aim to have your patients ambulating, both for manual compression and closure device use?

My minimum bed rest time is 1 to 2 hours after closure device use and between 3 and 6 hours after manual compression, depending on the access sheath size. ■

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- Interventional cardiologist
- Seattle Cardiology and Swedish Medical Center
- 21 years of experience in vascular practice
- Approximately 40 to 50 endovascular procedures per month

ACCESS

What type of algorithm do you follow in deciding on an access strategy?

I typically use femoral access for iliac procedures. I use ipsilateral access for common iliac and contralateral access for internal-external iliac procedures. SFA-

popliteal access is achieved usually by a contralateral femoral route. Tibial-peroneal access is usually achieved antegrade femoral.

When accessing tibial lesions, do you prefer antegrade or retrograde access?

I prefer antegrade access.

What is the most common access site complication you see in your practice? Is it preventable? What do you do to minimize its occurrence?

Hematomas and pseudoaneurysms are the most common complications we see. These can be minimized by using bivalirudin and active vessel closure.

What is the most important lesson you have learned in proper vessel access techniques?

Make sure you are in the midcommon femoral artery—not too high or too low.

In what ways should venous access be performed differently than arterial?

This is not nearly as complicated of an issue. Typically, I use ultrasound and micropuncture for access of veins other than the common femoral.

Do you use ultrasound guidance or just feel for pulse during access? When do you use one or the other? For arteries?

I use SmartNeedles (Vascular Solutions, Inc., Minneapolis, MN) and SonoSite (Bothell, WA) when the access is poor or the pulse is not palpable.

What is one device modification that would help to optimize vessel or lesion access?

The ability to inject contrast without manipulation of the needle under the tube would be helpful.

CLOSURE

Do you use primarily manual compression, assisted compression, or vascular closure devices in standard peripheral interventional cases?

I use vascular closure devices whenever possible to minimize access bleeding complication risk, especially when larger sheaths are used.

Which factors have most contributed to your decision in closure methods?

We use Angio-Seal (St. Jude Medical, Inc., St. Paul, MN) and StarClose (Abbott Vascular, Santa Clara, CA) at our institution. This is largely driven by the body of evidence supporting their use in interventional cases.

Which patients are well suited to having a closure device used?

Patients in whom there is minimal disease of the femoral artery and proper position of the stick was achieved.

Which are not ideal candidates?

Patients with scar tissue or small, diseased arteries are generally not good candidates for closure device use.

What is the role of ultrasound guidance in closure device use?

Ultrasound guidance plays a role in the placement of antegrade sheaths.

How quickly do you aim to have your patients ambulating, both for manual compression and closure device use?

We like to have patients walking 2 to 4 hours after closure device use and 6 to 8 hours after manual compression, depending on the sheath size. ■

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- Auckland Hospital and Auckland University School of Medicine
- 15 years of experience in vascular practice
- Approximately 60 endovascular procedures per month

ACCESS

What type of algorithm do you follow in deciding on an access strategy?

I am involved in peripheral intervention, and the vast majority of these cases are performed via common femoral artery access. Decisions with regard to percutaneous closure device selection are influenced by four major factors: access sheath size, antegrade/retrograde approach, quality of the common femoral artery (calcification, thrombus), and the degree of anticoagulation administered during the procedure.

When accessing tibial lesions, do you prefer antegrade or retrograde access?

I am happy with either approach. For relatively simple tibial lesions, I will often use a contralateral retrograde approach so that the ipsilateral common femoral artery is left intact. However, for more difficult lesions (eg, long tibial artery occlusions), I prefer an ipsilateral antegrade approach to maximize torque control and pushability.

What is the most common access site complication you see in your practice? Is it preventable? What do you do to minimize its occurrence?

Groin hematoma is still the most common access site complication in our practice. Although this can be minimized with ultrasound guidance and the judicious use of closure devices, it will never be completely avoided.

What is the most important lesson you have learned in proper vessel access techniques?

We have tableside ultrasound available for all arterial access, and it is a mistake not to use it. This avoids inadvertent puncture of the superficial or deep femoral arteries (or the external iliac artery above the inguinal ligament) and allows the healthiest segment of artery to be accurately targeted.

In what ways should venous access be performed differently than arterial?

Ultrasound is always used, and aspiration is used to confirm venous puncture.

Do you use ultrasound guidance or just feel for pulse during access? When do you use one or the other?

Ultrasound all the time.

What is one device modification that would help to optimize vessel or lesion access?

I'm not sure we need a new device. Certainly, the routine use of ultrasound is a major development for optimum access (different from closure). Having a readily visible needle tip on ultrasound is also of great value.

CLOSURE

Do you use primarily manual compression, assisted compression, or vascular closure devices in standard peripheral interventional cases?

Vascular closure devices for any access > 5 F. Manual compression for all 4-F access and most 5-F access.

Which factors have most contributed to your decision in closure methods? What are the most significant pros and cons of manual compression and closure device use in your opinion?

Sheath size is the most important influence on the use of closure devices versus manual compression. The major advantage of manual compression is that it is cheap and relatively safe, but disadvantages include patient pain, bleeding, and the time-consuming nature of this technique. Disadvantages of closure devices include cost, occasional failure, and rare complications, whereas advantages include safe closure, early mobilization, and time efficiency.

Which patients are well suited to having a closure device used?

Patients undergoing procedures with larger access sheaths (especially ≥ 6 F) and with relatively healthy femoral arteries.

Which aren't ideal candidates?

Patients with small access sheaths and very diseased femoral arteries (especially heavy calcification and small caliber) are not good candidates.

What is the role of ultrasound guidance in closure device use? In which patients do you use it?

Routine—all patients.

Do you primarily use only one closure device, or do you select from a variety based on the specific characteristics of the case?

For large-hole access (≥ 8 F), I routinely use Perclose (Abbott Vascular, Santa Clara, CA). For smaller access (usually 6–7 F), I use a variety of Perclose, StarClose (Abbott Vascular), Mynx (AccessClosure, Inc., Mountain View, CA), and occasionally Angio-Seal (St. Jude Medical, St. Paul, MN). For a high-bleeding-risk 5-F case, I use Mynx.

How quickly do you aim to have your patients ambulating, both for manual compression and closure device use?

For manual compression (4–6 F), ambulate after 4 hours. For manual compression larger than this (rare), ambulate after 6 hours. For percutaneous closure, ambulate after 2 hours but large hole (eg, 12 F), still 4 to 6 hours. ■

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