

THE PERFECT PLAYBOOK

Pedal Access Guide



Scout the Route



Tighten it Up



Go Distal First



Go Like a Pro



Ease the Squeeze



Scout the Route

Perform pre-procedural venous assessment and mapping using duplex ultrasound to evaluate vein patency, caliber, depth, compressibility, and continuity. Map the venous anatomy directly on the patient to identify primary and alternate access targets, paying close attention to tortuosity, branching, and proximity to the corresponding arterial anatomy.

If the route is out, take the venous detour: if the corresponding arterial segment is occluded or heavily calcified, evaluate alternate venous pathways for access. An ideal pathway will have a corresponding artery to feed the venous system.



Tighten it Up

Apply a tourniquet or pressure cuff at the proximal calf or distal thigh to augment venous filling and improve target visualization. This increases venous diameter and reduces collapsibility during ultrasound-guided access.

Avoid placing the tourniquet immediately proximal to the planned access site, as this can limit local venous filling, distort anatomy, and reduce procedural working length.



Go Distal First

Begin venous access distally in the calf, near the ankle, whenever feasible. Starting distal preserves proximal vein segments, providing room to progress proximally if initial access attempts are unsuccessful or if wire advancement requires repositioning. This strategy maintains flexibility and minimizes the need to abandon a viable venous pathway prematurely.



Go Like a Pro

Use a generous amount of ultrasound gel—or a standoff pad—to improve acoustic coupling while minimizing direct probe pressure on superficial veins. Adequate gel acts as a buffer, helping prevent venous compression and improving visualization of vein walls, lumen, and needle entry.



Ease the Squeeze

Reduce probe pressure to avoid vein collapse. Use a light, controlled grip on the transducer—holding it with the thumb, index, and middle fingers—while anchoring your hand with the ring finger and pinky against the patient. This stabilizes the probe while maintaining a low-pressure interface, allowing the vein to remain patent and clearly visualized during

Posterior and Anterior Tibial Vein

Equipment

Posterior Tibial Vein & Anterior Tibial Vein

High-frequency L-shaped ultrasound transducer (10–15 MHz) – often referred to as a “hockey stick” probe an ample amount of ultrasound gel

Patient Positioning

Posterior Tibial Vein

Supine with a modified reverse Trendelenburg position utilizing a pillow or rolled towel to prop the patient's knee slightly

Leg externally rotated with the knee slightly flexed

Foot everted to expose the medial ankle region

This positioning helps bring the posterior tibial vein and accompanying artery closer to the surface and more accessible to the probe.

Anterior Tibial Vein

Supine with a modified reverse Trendelenburg position utilizing a pillow or rolled towel to prop the patient's knee slightly

Knee slightly flexed to relax anterior muscles

Leg in neutral or slightly internally rotated position

Dorsiflex the foot if needed to expose the anterior compartment

Probe Placement

Posterior Tibial Vein

Place the probe in transverse (short-axis) orientation just posterior to the medial malleolus

Anterior Tibial Vein

Place the probe in transverse (short-axis) orientation over the anterior aspect of the lower leg, just lateral to the tibial crest and above the anterior ankle joint

Identification

Posterior Tibial Vein & Anterior Tibial Vein

In transverse view, the posterior tibial artery is flanked by two veins, forming a venae comitantes pattern:

- The tibial veins (paired) appear compressible and thin-walled
- The artery appears pulsatile and non-compressible
- Use color Doppler to differentiate arterial from venous flow

Confirmation

Posterior Tibial Vein & Anterior Tibial Vein

CONFIRM WITH COMPRESSION

- Gently compress with the probe
- Veins should collapse completely
- The artery remains patent
- Incomplete compressibility may indicate DVT

CONFIRM WITH DOPPLER

- Apply color Doppler:
 - Phasic venous flow with respiration
 - Pulsatile flow in the artery
- Use spectral Doppler to evaluate normal venous waveform when needed

Anatomy Recap

Posterior Tibial Vein

Posterior Tibial Veins (paired):

- Accompany the posterior tibial artery
- Run in the deep compartment of the leg, posterior to the tibia, and posterior to the medial malleolus at the ankle

Anterior Tibial Vein

Anterior Tibial Veins (paired):

- Accompany the anterior tibial artery
- Run in the anterior compartment, between the tibia and the interosseous membrane
- More accessible in the distal leg, near the ankle joint, lateral to the tibia

Tourniquet Use

Posterior Tibial Vein & Anterior Tibial Vein

Utilize a venous access tourniquet or a sterile glove to create a tourniquet at the proximal calf, distal to the popliteal fossa. Do not create a tourniquet immediately proximal to where you are accessing as this will compress out the veins.

Popliteal Vein

Equipment for Popliteal Vein

High-frequency linear transducer (10–15 MHz)
Curvilinear probe (5–8 MHz) may be needed in larger patients

Patient Positioning for Popliteal Vein

Lateral decubitus or frog-leg supine position can be used since prone is not feasible

Leg should be slightly flexed at the knee to open the popliteal fossa

Positioning exposes the popliteal neurovascular bundle, located in the popliteal fossa, posterior to the knee.

Probe Placement for Popliteal Vein

Place the probe in transverse (short-axis) orientation over the popliteal fossa

- Start mid-fossa and scan proximal to distal to follow the popliteal vein
- The popliteal vein lies superficial and posterior to the popliteal artery

Identification for Popliteal Vein

In transverse view:

- The popliteal vein is compressible, thin-walled, and located superficial and slightly lateral or posterior to the popliteal artery
- The popliteal artery is non-compressible, pulsatile, and has a thick wall
- Use color Doppler to confirm blood flow and distinguish vein from artery

Confirmation for Popliteal Vein

CONFIRM WITH COMPRESSION

- Apply gentle pressure with the probe
- The vein should collapse easily
- The artery should remain open
- Incomplete vein compressibility may suggest DVT

CONFIRM WITH DOPPLER

- Apply color Doppler to confirm:
- Phasic flow in the vein with respiration
- Pulsatile flow in the artery
- Use spectral Doppler if needed to evaluate normal venous waveform

Anatomy Recap for Popliteal Vein

- The popliteal vein lies posterior to the popliteal artery in the popliteal fossa
- It receives blood from:
 - Anterior tibial vein
 - Posterior tibial vein
 - Peroneal vein
- It becomes the femoral vein as it ascends into the thigh

Tourniquet Use for Popliteal Vein

Not necessary.

Troubleshooting

Problem: Difficulty locating the vein / poor visualization

Solution:

- Use color Doppler to differentiate the veins from the artery (vein has non-pulsatile, low-velocity flow).
- Follow the tibial artery — the paired veins should run adjacent to it.
- Try a long-axis view if short-axis is unclear.
- Adjust gain and TGC to improve contrast between vessel walls and surrounding tissues
- Increase the amount of gel utilized to help decrease probe pressure
- Place a rolled towel under the proximal calf or distal thigh to create venous dependency.

POSTERIOR TIBIAL VEINS:

- Externally rotate the leg more and slightly flex the knee.
- Turn the foot outward (eversion) to stretch overlying tissue and improve access.
- Use high-frequency linear probe (10–15 MHz) with optimized depth (~1–4 cm).
- Start scanning just posterior to the medial malleolus, where the vein runs with the artery and tibial nerve.

ANTERIOR TIBIAL VEINS:

- Slightly internally rotate the leg.
- Dorsiflex the ankle.
- Use high-frequency linear probe (10–15 MHz) with optimized depth (~1–4 cm).
- Start scanning at the anterior lower leg, just above the ankle and place the probe between the tibia and fibula.

POPLITEAL VEIN:

- Externally rotate the leg or use a frog-leg position.
- Place multiple rolled up towels under the distal thigh to create space between the bed and the popliteal fossa.
- Start scanning in the mid-fossa and move slowly.
- Increase imaging depth to visualize deeper structures.
- Adjust focus to the depth of the target vessel.
- Curvilinear probe (5–8 MHz) may be needed in larger patients

Problem: Vein collapses during probe pressure

Solution:

- Minimize probe pressure by using a generous amount of gel and lighter touch.
- Slightly tilt the probe rather than pressing directly downward.
- Apply a warm compress to the lower limb to promote vasodilation.

TIBIAL VEINS:

- Gently squeeze patients' foot to increase venous return.

POPLITEAL VEIN:

- Utilize calf pump maneuvers to augment venous filling.

Problem: No flashback after needle insertion

Solution:

- Confirm needle tip is visualized in-plane (long-axis) or out-of-plane (short-axis) with ultrasound.
- If needle tip is in the vein but no flashback:
 - Attempt gentle aspiration with a small syringe.
 - Lower the angle of approach (15–30°) for a longer tract inside the vessel.
 - If using micropuncture, try injecting a small amount of saline to confirm position by visualizing turbulence.
- If out of the vein, withdraw slightly and redirect under visualization.

Problem: Difficulty advancing wire

Solution:

- Ensure the needle is fully inside the vein and not partially through the wall.
- Use gentle, non-forceful advancement of a floppy-tipped wire (0.018" or 0.014").
- Try rotating or "jiggling" the wire slightly to help it find the lumen.
- Inject saline to open the lumen and help guide the wire forward.
- Confirm with real-time ultrasound that the wire is tracking centrally in the vein.
- If resistance persists, remove needle and wire, apply pressure, and reattempt at a nearby site.

Troubleshooting

Problem: Vein spasm or collapse after access

Solution:

- Use intra-luminal warm saline flush to relieve spasm.
- Administer a small amount of lidocaine around the vein to reduce irritation.
- Try valve-sparing technique by advancing wire without repeated manipulation.

Problem: Bleeding or hematoma

Solution:

- Apply immediate local pressure for several minutes.
- Use ultrasound to identify hematoma and avoid puncturing the same site.
- Choose a new site proximally, ensuring clear visualization.
- Consider using micropuncture system to reduce trauma on reattempt.

Problem: Poor needle tip visibility

Solution:

- Use an in-plane technique for real-time visualization of the needle tip.
- Use a steeper angle (45°–60°) if needed for shallow veins.
- Move slowly and pause frequently to confirm tip location.
- Enhance needle echogenicity using:
 - Beveled or echogenic-tip needles
 - Agitating the needle slightly to produce movement artifact

Tips & Tricks

Switch Between Short- and Long-Axis Views

- Short-axis view helps locate the bundle (2 veins + 1 artery).
- Long-axis helps confirm continuity and identify valves or clots.
- Switch between both views for confirmation.

Use Color Doppler

- Lower the color scale (velocity) to detect slower venous flow (~10–20 cm/s).
- Adjust the color box size and steering angle to align with flow direction.
- Tilt the probe slightly to get better flow detection.
- Increase color gain until noise appears, then reduce slightly.

Use Gentle Compression

- Apply gentle pressure with the probe:
 - Veins should compress fully.
 - Arteries will resist compression and remain patent.
- Avoid too much pressure, which can obliterate small or collapsible veins.

Identify the Artery First

• TIBIAL VEINS:

- Use pulsatile Doppler signal to locate the tibial artery
- Veins typically lie on either side or posterior to the artery
- Once found, follow proximally to identify the veins

• POPLITEAL VEIN:

- Locate the pulsatile popliteal artery
- The vein lies superficial/posterior to the artery
- Trace proximally or distally to confirm anatomy

Warm the Extremity

- Warm the room or use warm gel to improve venous filling.
- Ask patient to relax the leg to reduce muscle tension and vasospasm.

Stimulate Venous Return

- Gently squeeze the patients foot a few times (for tibial access) or squeeze calf muscle (popliteal access).
- This increases venous return and makes veins easier to detect with Doppler.

Switch to Lower Frequency Probe if Needed

- For obese or muscular patients, use curvilinear (3–5 MHz)
- Sacrifices resolution but improves depth penetration

Tips & Tricks

Mark the Vessel(s) for Access

- Mark the skin over the center of the vein using ultrasound guidance.
- Use this landmark for guided puncture or further evaluation.

Confirming Intravascular Access

- Look for free-flowing dark venous blood (non-pulsatile).
- Use saline flush test (visualize bubbles/turbulence within the vein on ultrasound).
- Confirm wire advancement with ultrasound (visualize in long-axis).
- Apply color Doppler to ensure vessel patency after wire placement.

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