Ultrasound-Guided

Peripheral Catheter Insertion

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Ultrasound-Guided Peripheral Catheter Insertion

Course Objectives:

1. Understand the principles and benefits of ultrasound-guided peripheral catheter insertion.
2. Identify the equipment required for ultrasound-guided peripheral catheter insertion.
3. Familiarize yourself with the anatomical landmarks and structures relevant to the procedure.
4. Learn the step-by-step process of performing ultrasound-guided peripheral catheter insertion.
5. Understand the potential complications and troubleshooting techniques.

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Introduction to Ultrasound Guided Peripheral Catheter Insertion

Ultrasound guidance is a technique that involves using real-time imaging to visualize blood vessels and guide the insertion of a peripheral catheter.

One of the primary benefits of using ultrasound guidance is the significantly improved success rates for IV insertion. Traditional blind techniques rely on palpation and visual estimation to identify suitable veins, which can be challenging in patients with difficult veins or those with specific conditions that make veins harder to locate. Ultrasound allows healthcare providers to visualize veins in real-time, enabling accurate identification of suitable vessels for IV placement. This precision leads to higher success rates and reduces the need for multiple attempts.

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Introduction to Ultrasound Guided Peripheral Catheter Insertion

Other benefits include:

- Improved patient comfort by locating and accessing veins at optimal locations and depths.
- Reduced complications due to the clinician's ability to accurately visualize veins and avoid nerves, arteries, and superficial veins more prone to thrombosis or phlebitis.
- Time cost and savings thanks to increased success rates and decreased time required for placement.
- Enhanced safety and accuracy for special populations, with ultrasound guidance enabling healthcare providers to identify suitable veins in challenging cases.

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Types of Ultrasound Machines

Portable ultrasound machines - Compact and lightweight, allowing for easy maneuverability and use. These offer high-resolution imaging capabilities, making them suitable for peripheral catheter insertion.

Console ultrasound machines - Larger and more advanced than portable models, they provide additional features and customization options that can be advantageous for peripheral catheter insertion in specific clinical settings.

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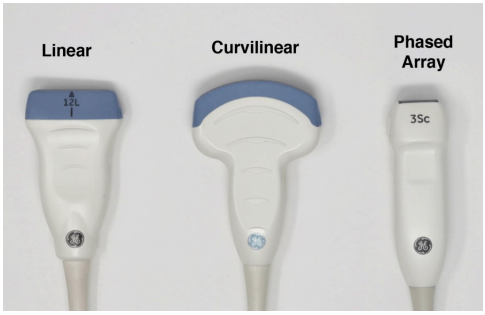
Types of Ultrasound Transducer

High-frequency linear transducers - The preferred choice for peripheral catheter insertion procedures due to their ability to provide excellent superficial resolution.

Phased array or curvilinear transducers - Phased array or curvilinear transducers may be used in cases where the target veins are located deeper or in larger patients, these transducers may provide better penetration and visualization.



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Other Equipment Necessary

- Sterile gel
- Clean gloves
- Antiseptic solution to clean probe
- Local anesthetic (optional, may require LIP order)
- IV start kit
  - 2x2 gauze
  - Tape
  - Antiseptic solution
  - Tourniquet
  - Bio-occlusive dressing
- Securement device
- Extension tubing
- Saline flush
- Catheter (22 gauge or larger)

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Veins and Landmarks Used in Ultrasound Guided PIV Insertion

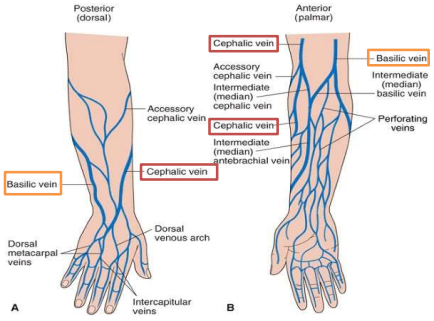
Cephalic Vein - Runs along the lateral aspect of the forearm and arm, starting from the hand and traveling upward towards the shoulder.

Basilic Vein - Follows course along the medial aspect of the forearm and arm, originating from the hand and continuing upward towards the shoulder.

Median Cubital Vein - Located at the antecubital fossa, connecting the cephalic and basilic veins.

Brachial Vein - Located in the medial aspect of the upper arm.

Antecubital Fossa - Located at the front of the elbow joint, insertion directly at the antecubital fossa is only recommended as a last resort.



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Procedure

1. Gather necessary equipment.
2. Power on the ultrasound machine and adjust the settings, such as depth, gain, and frequency.
3. Ensure the patient is positioned comfortably and expose the relevant limb while maintaining patient privacy, recommended that the patient be in bed.
4. Wash your hands and don clean gloves.
5. Apply tourniquet.
6. Apply gel to ultrasound probe.
7. Perform a first reconnaissance to locate a suitable vein. Apply pressure with the probe to ensure the blood vessel compresses and is non-pulsatile (is not an artery).

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Procedure (cont'd)

8. Mark insertion site.
9. Clean excess gel on probe and patient's skin.
10. Release tourniquet.
11. Remove gloves, wash your hands, and don clean gloves.
12. Tighten tourniquet.
13. Cleanse the skin at the intended insertion site with an antiseptic solution and allow it to air dry.
14. Cleanse the ultrasound probe with an antiseptic solution to maintain aseptic conditions during the procedure.
15. Apply probe cover to probe, applying sterile gel to the inside of the cover and then again to the outside

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Procedure (cont'd)

16. Using ultrasound guidance, insert the catheter needle into the vein at an appropriate angle and with controlled, gentle advancement. Confirm proper catheter tip placement within the vein under ultrasound visualization.
17. Slide the catheter over the needle into the vein.
18. Once the catheter is properly positioned, remove the needle while holding the catheter in place.
19. Secure the catheter using an appropriate securement device.
20. Attach a syringe filled with saline to the catheter hub, check for blood return, and gently flush to confirm catheter placement and patency.
21. Apply an appropriate sterile dressing over the catheter insertion site to maintain a clean and secure environment.

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Proper documentation of the procedure should include the following:

- Record the procedure's date and time.
- Describe catheter type, size, insertion site, and ultrasound guidance utilization.
- Describe the insertion technique, anesthesia method, and ultrasound machine details.
- Document the condition of the insertion site and any abnormalities.
- Record encountered complications and steps taken to manage them.
- Describe the catheter securement method and dressing used.
- Document the patient's response, including pain, discomfort, or adverse reactions.

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Potential Complications

The potential complications of ultrasound-guided peripheral catheter insertion, while less likely to occur than with traditional placement, are the same and include:

- Hematoma
- Infiltration
- Phlebitis
- Catheter-related Bloodstream Infection
- Nerve or tissue injury

It's important to note that the risk of complications can be minimized by following proper insertion techniques, adhering to infection control protocols, and regularly assessing the catheter and insertion site. Early recognition, prompt management, and appropriate documentation of complications are crucial for ensuring patient safety and improving outcomes.

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Tips for troubleshooting difficulty visualizing the vein

- Adjust the ultrasound machine settings - Optimize the depth, gain, and frequency settings to improve vein visualization.
- Change the transducer position - Manipulate the transducer's position and angle to obtain a better view of the vein.
- Use compression or release techniques - Apply gentle compression or release to the limb to enhance vein visualization.
- Consider alternative sites - If the targeted vein is not clearly visualized, explore nearby areas or consider alternate sites for catheter insertion.

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Tips for troubleshooting inadequate catheter insertion

- Ensure proper needle alignment - Confirm that the needle or catheter is correctly aligned with the vein before advancing.
- Adjust the insertion angle - Modify the insertion angle if the catheter is not entering the vein smoothly.
- Reposition the needle - If the catheter is not advancing properly, retract the needle slightly and reposition it before attempting insertion again.
- Use real-time ultrasound guidance - Continuously visualize the catheter insertion under ultrasound guidance to ensure accurate placement within the vein.

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In Conclusion

Ultrasound guidance for peripheral IV insertion offers numerous benefits, including increased success rates, improved patient comfort, reduced complications, time and cost savings, and enhanced safety for special populations. By harnessing real-time visualization, ultrasound technology improves the accuracy and efficiency of IV insertion, leading to improved patient outcomes and experiences.

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References

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- Stolz LA, Stolz U, Howe C, Farrell IJ, Adhikari S. Ultrasound-Guided Peripheral Venous Access: A Meta-Analysis and Systematic Review. The Journal of Vascular Access. 2015;16(4):321-326. doi:10.5301/jva.5000346

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