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Inserting a Peripheral Intravenous Catheter
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Inserting a Peripheral Intravenous Catheter

Overview

Placing a peripheral intravenous catheter (PIV) is an invasive procedure and requires the use of aseptic no-touch technique. Careful preparation and teaching prior to beginning the PIV placement procedure is imperative to ascertain appropriate placement sites and instruct the patient on possible complications. Common intravenous venipuncture sites are the arm and hand in adults and the foot in children. According to the Intravenous Nurses Society (INS) feet should be avoided in the adult population because of the risk of thrombophlebitis. Venipuncture sites should be carefully assessed for contraindications such as pain, wounds, previous cerebral vascular accident (CVA), dialysis fistulas present, sites on the same side where a mastectomy has been performed, or any decreased circulation. The most distal site available on the hand or arm is preferred so that future venipuncture sites may be used if infiltration or extravasation occurs. The purpose of PIV insertion is to infuse medications, intravenous fluid therapy, or to inject radioactive tracers for special examination procedures. In this procedure, a PIV securement device is used to stabilize the intravenous catheter according to INS recommendations, however facilities may not elect to purchase these devices and the alternate taping method of chevron or U-shape taping may also be used.

Procedure and representative findings

1. General peripheral intravenous catheter (PIV) placement considerations (review in the room, with the patient).

- 1.1 Upon first entering the patient's room, wash hands with soap and warm water, and vigorous friction for at least 20 seconds. Hand sanitizers may be used if the hands are not visibly soiled, but vigorous friction should also be used.

- 1.2 At the bedside computer, log into the patient's electronic health record and review the patient's orders for PIV insertion needs. Review patient history for potential bleeding complications during insertion such as bleeding disorders, anticoagulant therapy, and low platelet counts. Obtain the patient's consent for procedure.

- 1.3 Verify the patient's identity using 2 independent identifiers, not including the patient's room number or bed number. Review with the patient any PIV insertion preferences, such as veins to avoid, decreased circulation, or any fistulas present.

- 1.3.1 Review the PIV insertion procedure with the patient, answering any patient questions or concerns, and review signs and symptoms of complications such as swelling at the IV insertion

site, redness around the IV insertion area, pain with fluid administration or flushing, and leaking of fluids at the IV insertion site.

2. Leave the patient room and wash hands following instructions from 1.1

3. Gather supplies needed for PIV insertion.

3.1 Select the smallest size over-the-needle catheter for the intravenous therapy being delivered and expected length of therapy.

3.1.1 Small bore sized over-the-needle catheters will maintain blood flow around the catheter keeping blood in contact with endothelial cells, allowing the IV to remain patent by minimizing infiltration/extravasation and phlebitis.

3.2 Gather IV insertion kit or 2 x 2 sterile gauze, transparent semipermeable occlusive dressing, IV extension tubing, needless connector, prefilled saline flush syringe, tourniquet, antiseptic swab containing chlorhexidine or 70% alcohol wipe, no sting barrier film preparation pad, clear 1 inch transpore tape, IV adhesive securement device, label, absorbent pad, and clean latex free gloves x2. Adhesive bandage is also recommended in case of failure to access a vein. In addition to adhesive bandage, duplicate supplies for multiple IV insertion attempts may also be needed. Note: chlorhexidine is preferred for the long acting antibacterial properties and recommended by the CDC.

4. Return to patient bedside for PIV insertion preparation, including washing hands when entering as described in 1.1

4.1 Explain the procedure to the patient and place them in a comfortable position. Adjust the bed height to maintain proper nurse positioning and decrease back strain. Ensure adequate lighting.

4.2 Place supplies within reach on a bedside stand or over-bed table and prepare the administration set.

4.2.1 Open the IV needless connector using aseptic technique and attach the prefilled saline flush syringe to the needless connector using your dominant hand taking special care to maintain sterility on both ends of the device. Move the syringe and needless connector to your non-dominant hand between your middle and ring finger.

4.2.2 Open the IV extension tubing using aseptic technique. While holding the tubing in your dominant hand remove the cap on the female end of the tubing with your non-dominant hand's thumb and forefinger.

4.2.3 Attach the IV extension tubing to the IV needles access device using aseptic technique.

4.2.4 Hold the IV extension tubing in your non-dominant hand with the capped male end pointed up toward the ceiling. Gently push the saline syringe plunger to prime the needless connector and extension tubing until all air has been removed and a few drops of saline are visible.

4.2.5 Place the primed needles connector and extension tubing within reach, leaving the saline flush syringe attached to the extension set.

4.3 Prepare remaining supplies for IV insertion.

4.3.1 Remove transparent occlusive dressing from packaging. Remove the backing leaving sticky side up and place within easy reach.

4.3.2 Remove 2 strips of clear transpore tape approximately 4 cm long each and place within easy reach.

4.3.3 Open 2 x 2 sterile gauze, chlorhexidine, IV adhesive securement device, and adhesive bandage packaging completely, leaving it on the sterile packaging and place within easy reach.

4.4 Don clean non-sterile gloves

4.5 Visually inspect both patient arms for possible insertion sites. Cephalic, basilica, and median cubital veins are preferred in addition to dorsal hand veins [Figure 1] [Figure 2]. Avoid the cephalic vein in the wrist area above the thumb to minimize nerve damage.

4.5.1 Use the most distal site in the non-dominant hand if possible to allow patient free movement of dominant hand and ensure future puncture sites are available. Median cubital should be avoided when possible to allow for blood draws, free movement, and avoid occlusion when IV fluid is administered.

4.5.2 Avoid areas that may be affected by pain, infection, wounds, and previous cerebrovascular accident (CVA) or distal to mastectomy. These areas will increase risks of infection, lymphedema or vessel damage and may prevent adequate blood flow around catheter.

4.6 Apply tourniquet around arm, not too tightly, approximately 10-15 cm above chosen site of insertion. Pulses distal to tourniquet placement should be palpable to avoid arterial blood flow occlusion.

4.7 Palpate chosen insertion site and assess for scleroses or hardened veins, infiltrate site or phlebitis vessels, bruising, or areas of venous valves. If chosen vein is soft and free of complications remove tourniquet temporarily and prepare for venipuncture.

4.8 Place the absorbent pad under the chosen insertion site arm.

4.9 Remove over-the-needle catheter from packaging. Hold catheter in non-dominant hand, with dominant hand remove the cap and place it between the ring and middle finger of the non-dominant hand. Assess the catheter and needle for irregularities.

4.9.1 Some over-the-needle catheters maintain suction tension from the sterilization process. Carefully move the catheter hub clockwise and back to original position to break the tension and allow for smooth advancement when in the vein.

4.10 Replace the over-the-needle catheter cap and set within easy reach. Remove gloves and discard in trash receptacle.

5. PIV insertion procedure

5.1 Wash hands as described in 1.1 and reapply clean gloves.

5.2 Re-apply tourniquet as described in 4.6

5.3 Tap chosen insertion site 2-3 times to vasodilate the vein.

5.4 Scrub insertion site in a back-and-forth motion with chlorhexidine swab for 30 seconds. Allow insertion site to completely dry. Drying allows for complete microbicidal activity and scrubbing with friction allows for penetration of crack and fissures in the epidermal layer.

5.5 Grasp over-the-needle catheter with non-dominant hand, remove cap and transfer to the dominant hand.

5.6 Using the non-dominant hand, stretch skin taught and stabilize the vein 4-5 cm below the insertion site taking care not to contaminate point of insertion.

5.7 Holding the over-the-needle catheter between the thumb and middle finger with bevel up, at a 15-20 degree angle pierce the skin directly over the vein until a flashback of blood is visible.

5.8 Drop the angle of the catheter a few degrees until almost level and advance the catheter with needle a just a few millimeters to ensure the tip of the catheter has passed into the vein [Figure 3].

5.9 Using the index finger, advance the hub of the catheter fully into the vein while holding the needle steady.

5.10 While holding the needle and catheter steady with the dominant hand, release the tourniquet with the non-dominant hand. Occlude the vein above the insertion site with the index finger of the non-dominant hand to reduce bleeding after needle removal.

5.11 Remove the stylet needle from the catheter with the dominant hand and engage the needle safety device if available. Place the needle down on the over-the-bed table or bedside stand.

5.12 Quickly obtain the pre-primed IV extension set with prefilled normal saline attached. Remove the cap from the male end and insert it into the catheter hub.

5.13 Remove the non-dominant hand from vein occlusion and stabilize the IV extension set. With the dominant hand gently push the pre-filled normal saline syringe and flush the IV to assess patency.

5.13.1 While flushing the PIV assess for swelling, redness or leaking at the IV insertion site. Ask the patient if they feel any pain while flushing. If none are present, firmly screw in the IV

extension set to the catheter hub if threaded twist-on attachment is present. Note: A cold sensation or salty taste in the mouth are both normal when flushing a PIV.

5.13.2 Again, flush the PIV slowly with the dominant hand while simultaneously engaging the clamp located on the IV extension set. Remove the pre-filled saline flush and discard it on the over-the-bed table or bedside stand.

6. Secure the PIV with dressings.

6.1 Retrieve the no sting barrier preparation pad, open the packaging, and spread a light film of barrier solution 1 cm from and around the insertion.

6.2 Retrieve the adhesive IV securement device, remove the backing, and place sticky side against the skin and directly under the catheter hub. Press (or slide) firmly on securement device to secure it to the catheter hub following manufacturer's instructions for the type of device used.

6.3 Retrieve the semipermeable occlusive transparent dressing, using two hand place the insertion point at the center of the dressing and lay it against the skin and over the catheter hub. Squeeze the dressing around the catheter hub to secure it to the adhesive and anchor the hub.

6.3.1 Alternate taping method when securement device is not available: Retrieve the 2 x 2 sterile dressing and fold it in half, then in half again, making a small 1 cm square. Place the dressing gently under the junction of the hub of the PIV catheter and the extension tubing to prevent skin breakdown and pressure between the catheter hub and skin.

6.3.2 Retrieve on piece of transpore tape, with sticky side facing up, lift the IV extension tubing and secure the tape under the hub and 2 x 2 dressing. Fold on end of the tape diagonally across the hub and over the transparent occlusive dressing. Fold the other end of the tape diagonally across the hub and over the transparent dressing, creating a chevron. Take care to leave the insertion site visible through the transparent dressing.

6.3.3 Variation: Fold one end of the transpore tape straight up and over the occlusive dressing. Do the same with the other end, creating a U-shape to secure the IV catheter to the occlusive dressing.

6.4 Loop the IV extension tubing in a U-shape pointing up past the insertion site, leaving the insertion site visible through the transparent occlusive dressing.

6.5 Retrieve the second piece of transpore tape and with both hand lay it across the IV extension tubing and secure it to the skin and occlusive dressing, again making sure to leave the insertion site visible through the transparent dressing. Note: the insertion site should always be visible for future evaluation of patency.

7. Retrieve the label and add the time and date of insertion with the initials of insertion nurse. More information may be needed based on hospital protocols and procedures. Place the label on the occlusive dressing.

9. Gather all packaging and needless prefilled saline syringe and discard in a trash receptacle. Discard the over-the-needle stylet in a sharps container.

10. Review signs and symptoms of complications in IV fluid therapy or medication administration as described in step 1.3.1

11. Remove and discard clean gloves in trash receptacle and wash hands as described in the above step 1.1

12. Document the PIV insertion in the patient electronic health record before leaving the patient room.

Summary

Placement of a peripheral intravenous catheter using venipuncture with an over-the-needle catheter for infusion therapy is an aseptic no-touch procedure. Always education the patient to the procedure and possible complications prior to venipuncture. Instruct the patient in both the process and pain associated with insertion. In addition, many patients mistakenly think the needle remains in the vein after venipuncture. It is important to emphasize that only the soft flexible catheter portion remains and they are able to move the limb freely without causing addition harm. Complications such as extravasation and infiltration may occur with any infusion. Instruct the patient on the signs and symptoms of both including any onset of pain and the one of the first signs of complications occurring. Prepare duplicate supplies prior to venipuncture in the event that a second venipuncture is necessary during the procedure to inaccurate placement. INS recommends only 2 venipuncture attempts per medical personnel before additional help is requested. Common mistakes in PIV placement include touching the venipuncture site after cleaning with antiseptic solution thereby contaminating the insertion site, not allowing solution to dry adequately causing a decrease antimicrobial action and inadequate adhesive action, and removing the needle from the catheter during insertion when flashback of blood does not occur increasing the possibility of puncturing the catheter or even causing the catheter to break into the vein. The Infusion Nursing Society regular researches intravenous catheter placement and should be referenced on a regular basis.

Figures

Figure 1: Peripheral IV Vein Sites, Arm
Venous structures showing best sites for IV placement

Figure 2: Peripheral IV Vein Sites, Hand
Venous structures showing best sites for IV placement

Figure 3: Advancing Catheter into Vein

When inserting the catheter into the vein you must advance past the bevel and flashback
http://www.terumo-gps.com/us/products/catheter_polyurethane_flashback.aspx

References

1. Infusion Nurses Society (2011). *Policies and procedures for infusion nursing*, 4th edition. Chapter 5, vascular access device site selection and placement.
2. Potter, P. A. & Perry, A. G. (2009). *Fundamentals of Nursing*, 7th edition. St. Louis, MO Elsevier Inc.