Science Education Collection

Peripheral Venous Cannulation

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Overview

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Placement of an intravenous (IV) catheter is one of the key procedures in medicine. The IV catheter allows patients to receive critical medications, including pain medicine, insulin, antibiotics, blood products, and fluids for rehydration. Additionally, placing an IV catheter allows for blood samples to be obtained, which can be sent to the laboratory for testing and evaluation. A majority of peripheral IV lines are placed in the superficially located veins of the upper extremities. IV catheters can be placed in any superficial vein from the upper arm to the hand (though the veins in the antecubital fossa are larger than those in the hand). IV catheters can be placed in the lower extremities as well; however, this procedure should be performed with caution in patients with a history of diabetes or poor peripheral circulation.

Procedure

1. Have the equipment ready.

The equipment needed for peripheral venous cannulation includes:

1. Gloves
2. Rubber tourniquet
3. Chlorhexidine or alcohol swabs
4. Combined catheter and needle mechanism
5. IV set of tubing and bags
6. Adhesive tape only or tape and clear adhesive dressing
7. 2x2 or 4x4 inch gauze
8. Normal saline 5 cc syringe for flush
9. 10 cc syringes for blood samples for lab examinations if needed

2. Familiarize yourself with the combined catheter and needle mechanism prior to placing the catheter for the first time. Catheters are packaged pre-threaded over needles; many have a safety mechanism in place that will automatically retract the needle and prevent a sharps exposure. When placing the IV, the catheter and needle are inserted together; then, the catheter is advanced and the needle withdrawn.

3. Select your catheter size based on the patient and the reason for IV therapy.

Catheters range in size from 14 gauge (the largest) to 24 gauge (for pediatric patients). Catheters are color coded to allow for easy identification and selection.

1. Select an average adult-size catheter—18 or 20 gauge for the majority of adult patients. For pediatric patients or adult patients with small vein size, 22 or 24 gauge catheters are used.
2. Choose a larger catheter, such as 14 or 16 gauge, if the patient requires large amounts of fluid or blood. "Short and fat" catheters provide a patient with the most rapid resuscitation.
3. Bring a few different sizes to the bedside when preparing, as vein size might be difficult to predict prior to tourniquet placement.

4. Preparation for the procedure

1. Wash your hands and wear non-sterile gloves.
2. Explain the procedure to the patient.
3. Position the patient with the arm extended and straight.
4. Place the tourniquet on the upper portion of the arm and tie it tightly: cross the ends over each other and tuck in one of the ends rather than making a knot. This ensures that the tourniquet can be easily removed after the vein has been accessed.

5. Choosing an insertion site

1. Feel and look for a "good" vein for placement of the catheter. This is the most challenging part of the procedure.
    1. Start the process of vein identification in the antecubital fossa, where vessels are largest, and then work your way down the arm.
        1. Feel for a vein by palpating for a "squishy" or "springy" area on the patients arm.
        2. Look for a vein by inspecting the patient's skin. Veins appear blue or gray in color. Patients who have darker skin coloring might have veins that are challenging to visualize.

2. If no vessel is identified in the antecubital fossa, work your way more distally to look for a vessel. You may need to reapply the tourniquet on the forearm for placement of an IV in the hand. Since all patients have different anatomies and varying medical histories, the best vessel for catheter placement will be different.
3. After you select which vein to use, select and unwrap the appropriately sized catheter.

6. Cleaning and prepping the skin

This step is important to decrease the rate of infection associated with peripheral IV placement.

1. Use a chlorhexidine skin prep or alcohol swab to thoroughly clean a broad area around the vein, in case the first attempt is not successful and the needle needs to be inserted into the skin in multiple locations.
2. After cleaning the skin, allow the area to dry completely, to ensure most effective infection prevention.

7. Inserting the catheter

1. Using the non-dominant hand pull the skin taut from the inferior/distal portion of the insertion site. This is done in order to prevent the vein from "rolling" or moving during the procedure.
2. Be sure to tell the patient to expect to feel a stick, and to keep the arm very still.
3. Remove the cannula cover.
4. Insert the needle at an angle of about 45 degrees to the skin with the bevel facing up. People have different ways of holding the catheter, but most hold it between the index finger and thumb.
5. Insert the needle slowly to ensure that you do not go through the vessel.
6. Expect to meet a small amount of resistance when poking the needle through the skin.
7. After the needle is inserted into the skin, watch the hub of the catheter/needle device for a "flash" of blood.
8. Once a small amount of blood is seen in the needle hub, advance a small bit more (a few mm), slightly lower your needle/catheter mechanism and begin to advance the catheter portion. Reduce the angle of insertion to prevent puncturing the posterior wall of the vessel.
9. Advance the plastic catheter fully into the vessel while holding the needle still.
10. Remove the tourniquet from the extremity. If blood is being drawn at the same time as IV placement, the tourniquet should stay on to facilitate that process.
11. To prevent blood spilling from the vein, place one or two gauze pieces just underneath the hub of the catheter before removing the needle (or safety mechanism located at the hub), and apply gentle pressure on the proximal portion of the catheter that is in the vessel.
12. Carefully remove the needle and place it promptly in a sharps container to prevent needle sticks.

8. Placing the tubing hookup and securing the line

1. Instruct the patient to hold the arm as still as possible.
2. Place the tubing hookup on the hub of the needle, and then remove the pressure from the proximal portion of the catheter.
3. Secure the peripheral IV line to the skin. The most common way this is accomplished is via a clear dressing combined with tape.
4. Adequately securing the line prevents it from becoming dislodged with patient movement. For patients who are diaphoretic or for pediatric patients, the line might need some additional tape or an arm board to keep it securely in place.

9. Saline flush

1. Once the line is secured, attach the saline flush syringe to the end of the tubing.
2. Draw blood back from the catheter by pulling backward on the plunger of the flush. Fill the entire tubing hookup with blood.
3. Flush the saline into the catheter.
4. Palpate the insertion site for swelling and ask the patient if any pain was experienced with the flush.

If the patient is experiencing no pain and one is able to draw blood back from the catheter, the catheter is in the correct location. Following placement, one can promptly begin to give the medications or fluids that the patient needs. If blood is not able to be drawn back, or if the line cannot be flushed (or is painful to the patient), there is a possibility that the catheter is not in the correct location within the lumen of the vein. The line should be further examined and assessed. If needed, remove the catheter and repeat the process at another insertion site.

Summary

Effectively placing an IV in a patient is imperative to treat many common medical problems. Common learner errors include not being prepared with all the supplies prior to starting the procedure and poor vein selection. Anecdotally, being able to "feel" the vein is more important than visualizing a vein. However, many learners will try and place an IV based on what they can see. In some groups of patients, peripheral IV placement might be challenging. These include current or prior intravenous drug users, patients with scarring of veins from caustic medications or medical conditions, or patients with peripheral vascular disease. This is truly a procedure that is perfected with practice and patience; take advantage of opportunities to place IVs in as many patients as possible to master the basics.