
PROGENY

VOL XXIII, NO 3

December 2007

MANAGING ACCESS IN THE NEWBORN: PART 1 PERIPHERAL IV'S

Peripheral IV's are the most commonly used vascular access device for delivering dextrose, parenteral nutrition, and medications to infants. In this issue of *Progeny*, we will review management issues related to insertion of the catheter, nursing documentation, potential complications with intravenous therapy, and treating infiltrations and extravasations.

INSERTION OF PIV CATHETER

First gather your supplies and prime the IV tubing. Next, select a site for venipuncture. Appropriate sites in the newborn include the anterior aspect of the hands and feet; the saphenous veins in the lower legs; the antecubital fossa veins in the arms; the dorsal aspect of the ankles and feet; and the scalp (see Figure 1). The IV catheter should always be pointed in the direction of venous flow to the heart. With scalp IV's, direct the catheter downward toward the face, ears, or neck. Avoid placing catheter tips close to the face. Always feel for a pulse to avoid accidental cannulation of an artery. You may consider using EMLA or L.M.X.4, a local anesthetic cream prior to insertion for infants >35 weeks gestation. Other non-pharmacologic pain interventions, such as swaddling and the sucrose pacifier are always beneficial. Enlisting an assistant to help stabilize the extremity and provide a tourniquet is optimal. Have your assistant hold while applying slight traction on the skin around the site. Don't forget to wear gloves. Cleanse the site with an alcohol swab, and allow it to dry. If you intend to draw a blood culture from this catheter before it is flushed, prepare the site according to your unit's protocol. With the bevel facing up, puncture the skin at a 15-45° angle in a head-on fashion, a few millimeters from the desired vein. Advance the needle slowly and observe for a "flashback." You may or may not feel a "pop" as you enter the vein. Slowly thread the catheter over the needle into the vein. At this point, you can use a blunt needle and syringe to aspirate blood from the hub of the catheter for the blood culture. Sterile technique is important here. Once the sample is obtained, flush the catheter with normal saline. Observe for blanching, edema, or redness. These signs usually indicate that the catheter is not in the vein. The catheter should flush easily, and in most cases you will note positive blood return. Once placement is verified, stabilize the IV catheter with a transparent dressing. The insertion site should be *completely visible*. Attach the IV solution tubing and secure it to the patient. Apply a padded arm board if needed to stabilize the extremity, but avoid placing tape over the transparent dressing. Maintaining visibility of the site is essential.

NURSING DOCUMENTATION

Documentation at the time of insertion should include the following: date and time of the venipuncture procedure; person performing the procedure; needle/catheter size; baseline description of the insertion site and reaction to flushing; interventions used for pain management; and the infant's tolerance of the procedure. For continuous infusion, there should be ongoing *hourly* assessment and documentation of the IV site appearance and infusion rate. IV Stage Codes are useful for site assessment (see Figure 2). Each stage may include signs/symptoms from the previous stage. Document the greatest degree of severity. For intermittent infusion, assessment of the site, stage, and ease of flushing should be documented at least every 6 hours and with each use. If infiltration or extravasation occurs, documentation should include the following: estimate of fluid volume infiltrated; medication and/or solution name; Stage of infiltration/extravasation; measurement of the affected area; notification of physician or LIP; nursing interventions; and antidote treatment.

POTENTIAL COMPLICATIONS WITH INTRAVENOUS THERAPY

This is not meant to be an exhaustive review of the potential complications associated with peripheral IV's. We will discuss several of the more common complications. Inadvertant cannulation of an artery at the time of insertion should be avoided. This usually occurs in one of three places: the radial artery at the anterior wrist, the posterior tibial artery behind the ankle, and the temporal artery above the ear. Always palpate for a pulse before inserting the catheter, and observe for blanching as the catheter is flushed. Most peripheral arterial lines will blanch when flushed rapidly. However, blood will quickly refill to the area, and the site will not be edematous. When in doubt, take it out. There are very few things we can safely deliver into an artery. Fluid overload with intravenous therapy is also a risk for the newborn. Infusion pumps should always be used, and the rate of infusion should be documented hourly. Catheter-related bloodstream infections are another potential complication with IV therapy. Aseptic technique at the time of insertion and each time the line is accessed will decrease the risk of infection. At our institution, practice regarding peripheral IV's has recently been changed to include cleansing the connection with alcohol before accessing the line. Drainage or fluid leaking from the insertion site is never normal. If this occurs, remove the catheter, and notify the physician or LIP. The newborn's risk for infection increases with every attempt at insertion. So, if you've tried three times to start the IV without success, it's time to ask for help. Finally, the most common complications associated with intravenous therapy are infiltration and extravasation. These terms are often used interchangeably, but they are not the same. *Infiltration* is the inadvertant administration of a *nonvesicant* solution or medication into the surrounding tissue. A nonvesicant does not cause blistering when it's infiltrated; examples include D5W and normal saline. *Extravasation* is the inadvertant administration of a *vesicant* solution or medication into the surrounding tissue. A vesicant will cause a blistering process when it's infiltrated; examples include dextrose solutions $\geq 10\%$, TPN, calcium, potassium, sodium bicarbonate, Nafcillin, Vancomycin, Acyclovir, Dopamine, and Epinephrine. When extravasation occurs, tissue damage is difficult to evaluate in the immediate period. It may take up to 24 hours for the skin to darken where tissue damage is evident. Constant vigilance and frequent assessment for the physical indicators of infiltration or extravasation are the keys to preventing injury related to intravenous therapy in the newborn.

TREATMENT OF INFILTRATIONS/EXTRAVASATIONS

Treatment is aimed at minimizing tissue damage, and intervention should be based on the Stage of infiltration or extravasation (see Figure 2). Elevation of the affected extremity is recommended for all infiltrates for at least 24 hours. Thermal modalities, the use of hot or cold, is still debated. But, it is generally agreed that moist heat should be avoided in the newborn. Surgical dressings made of amorphous hydrogel are emerging as a new treatment for iatrogenic wounds associated with intravenous therapy. Silver sulfadiazine, applied twice daily, has also been used to treat mild to extensive burns. Hyaluronidase, an antidote used for extravasation of higher osmotic solutions and some medications has been described. In newborns, it is administered SQ or ID in 4-5 injections of 0.20-0.25ml per injection, using a new 25-27g needle each time. Injections are given circumferentially around the site with the needle directed to the center of the area of infiltration. Treatment is most effective when the antidote is given within one hour of the event. However, there have been reports of response after 12-24 hours. Hyaluronidase should not be used for extravasation of vasoconstrictive agents or in areas of infection. Phentolamine is an antidote used for extravasation of vasopressors, such as Dopamine or Norepinephrine.

Figure 1

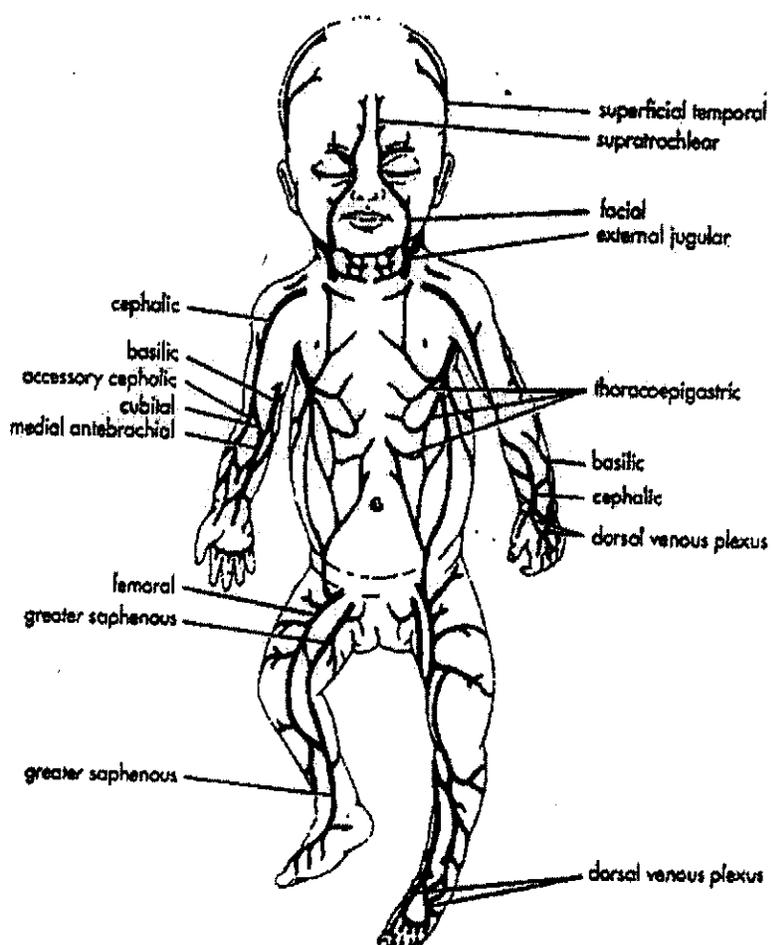


Figure 2

Stage	Characteristics	Intervention
Stage 0	No redness, pain, edema, blanching, tenderness or drainage. Flushes with ease	None
Stage 1	Mild redness Mild edema Flushes with ease Skin warm to touch Good distal pulses 1-2 second distal capillary refill	Treatment based on clinician discretion Check tapes Elevate extremity Consider using alternative site for meds and IV fluids
Stage 2	Persistent mild redness Persistent mild edema Flushes with difficulty Pain at site Skin blanched Skin cool to touch Good distal pulses 1-2 second distal capillary refill	Remove IV Elevate extremity Apply thermal modalities where appropriate Treatment based on clinician discretion, may opt to treat with antidote in some cases Complete Incident Report if antidote given Document/continue observation. If antidote given, assessment and documentation of site and response will be done every hour x 6 hours, every 4 hours x 24 hours, and then PRN.
Stage 3	Moderate edema Moderate redness Skin blanched Flushes with difficulty Pain at site mild-moderate Skin cool to touch Good distal pulses 1-3 second distal capillary refill	Aspirate residual fluid from IV access device Notify LIP If access device not needed for treatment, discontinue IV If access device needed for treatment, leave IV in for antidote administration If tissue damage is severe, clinician may opt to remove IV device and either select a new site for antidote administration or give by another route Administer antidote if available Apply thermal modalities where appropriate Complete Incident Report Assessment and documentation of site and response to any interventions will be done every hour x 6 hours, every 4 hours x 24 hours, and then PRN.
Stage 4	Moderate to severe and/or pitting edema Persistent redness, discoloration, bruising Skin blanched Pain at site moderate-severe Skin cool to touch Skin breakdown or necrosis Decreased or absent distal pulses > 3 second distal capillary refill Any amount of blood product, irritant or vesicant	Same as above Stage 3.

Adapted from: Flemmer and Chan, 1993; Intravenous Nursing Society, 2000; Millam, 1988; Winskunas, 1990.

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