Nursing Management of Venous Access Devices: Complications and Troubleshooting

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The Three Biggies

- **Phlebitis**
- **Extravasation**
- **Infiltration**

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Phlebitis – in Peripheral IVs

- Phlebitis has long been recognized as a risk for infection.
- For adults, lower extremity insertion sites are associated with a higher risk for infection than are upper extremity sites.
- Intravenous Nursing Society (INS) phlebitis scale;
  - Grade 0  no symptoms
  - Grade 1  erythema at insertion site with or without pain
  - Grade 2  pain at insertion site; with erythema and/or edema
  - Grade 3  pain at insertion site; with erythema and/or edema; streak formation; palpable venous cord
  - Grade 4  pain at insertion site; with erythema and/or edema; streak formation; venous cord > 1” in length; and purulent drainage
Prevention and Treatment of Phlebitis

**Prevention:**
- “When in doubt, take it out”
- Dilution of infusate
- Decrease rate of infusion
- “Piggy-back” with mainline IV
- Warm compress to promote vasodilation and hemodilution
- Device securement / stabilization

**Treatment**
- Removal of catheter
- Application of warm compresses at insertion site
- Documentation of phlebitis and the subsequent treatment
Infiltration

**Definition:** inadvertent administration of non-vesicant medication or solution into the surrounding tissue (INS, 2011)

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INS Infiltration Scale

- **Grade 0** - no symptoms
- **Grade 1** - skin blanched, edema < 1” in any direction, cool to touch, with or without pain
- **Grade 2** - skin blanched, edema 1-6” in any direction, cool to touch, with or without pain
- **Grade 3** - skin blanched and translucent, gross edema > 6” in any direction, cool to touch, mild to moderate pain, possible numbness
- **Grade 4** - skin blanched and translucent, skin tight and leaking, discolored, bruised and swollen, gross edema > 6” in any direction, deep pitting tissue edema, circulatory impairment, moderate to severe pain, infiltration of ANY amount of blood product, irritant, or vesicant.
Treatment of Infiltration

- Discontinue infusion
- Elevate extremity
- Warm compresses, NOT HOT, for normal or high pH/alkaline solution (ex: D5W)
- Cold compresses for low pH/acidic solutions (ex: vanco)
- **Caution with infiltrated solution; ex.- morphine PCA resumption with subcutaneous morphine infiltrate**
- Documentation of infiltrate and subsequent treatment
Extravasation

- Inadvertent administration of vesicant medication or solution into the surrounding tissue (INS, 2011)
- Definition of a vesicant drug – any IV drug that can cause blistering, severe tissue injury or tissue necrosis when extravasated

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Extravasation

- Extravasation should always be grade 4 on the infiltration scale. This includes any amount of vesicant, blood product, or irritant.
- Incidence is similar for peripheral and central line administration.
- Risk factors, such as fragile vessels, location of peripheral iv, or catheter integrity are things to consider.
- Antidotes may be used; refer to clinical resources for guidance, and obtain order if indicated.
- Many non-chemotherapy agents have vesicant properties (e.g. Dopamine, Epinephrine, Gentamycin, Mannitol)
- Extravasation is still possible, even in the presence of a positive blood return.

Refer to MGH Nursing Policies and Procedures Trove 08-02-01
Signs and Symptoms of Extravasation

- Early warning signs of possible extravasation
  - Swelling
  - Stinging, burning or pain at IV site
  - IV flow that stops or slows
  - Leaking around the port needle
  - Lack of blood return
  - Erythema, inflammation or blanching

- Other symptoms/damage resulting from extravasation:
  - Induration
  - Vesicle Formation
  - Necrotic tissue damage can progress for 6 months
  - Sloughing
  - Tendon, nerve, joint damage
  - Blistering at insertion site
  - Ulceration is usually seen 2-3 days to weeks following extravasation
Management of Extravasation

TREATMENT

- IMMEDIATELY STOP INFUSION
- Remove tubing from IV, leave catheter or needle in place, attach syringe to IV catheter
- Attempt to aspirate residual drug
- Elevate extremity
- Notify MD and clinical resources as soon as possible
- Apply cold/heat as indicated. In General:
  - All drugs except Vinca alkaloids, etoposide, and catecholamines...apply ICE for 15-20 minutes (minimum of QID) for 48 hrs
  - For vinca alkaloids, etoposide and catecholamines...apply heat for 15-20 minutes (minimum of QID) for 48 hours
- Refer to MGH Nursing Policies and Procedures Trove 08-02-01 or CALL PHARMACY for specific antidote
Extravasation Management

- DOCUMENTATION
  - Medical record
  - Safety report

- Post extravasation care:
  - Document and consider photographing site
  - Instruct patient about cold/heat application
  - Patient and family education of symptoms to report immediately, care of site, follow-up appointment if needed
  - Anticipate consult to plastic surgery or dermatology PRN
Port extravasation

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Other Potential Complications of Central VADs

- **Central Line Infection**
  - Line sepsis
  - Port pocket infection
- **Catheter occlusion**
  - Fibrin sheath
  - Thrombosis
  - Thromboembolism
- **Catheter rupture/Fracture**
- **Device rotation**
- **Air embolism**
- **Bleeding**
- **Cardiac arrhythmias**
- **Port erosion through the skin**
- **Catheter migration**
- **Intolerance reaction to VAD**
Central Line Infection

- Insertion site: Reportable signs and symptoms
  - Any redness (erythema)
  - Leaking, bloody, or purulent drainage
  - Tissue inflammation or induration
  - Tenderness to palpation

- **Do not** access a port with above signs and symptoms
Troubleshooting Occlusions

- **Complete catheter occlusion**
  - Internal thrombus
  - Drug precipitate
- **Withdrawal occlusion**
  - Fibrin sheath causes catheter to act like a one-way valve
  - Pinch-off syndrome
- **Does CVAD flush freely and have a positive blood return? If not:**
  - Check for kinks in external catheter or tubing
  - Check clamps
  - Change needleless connector or implanted port needle
  - Reposition patient (on side, Trendelenburg etc…), ask patient to cough, raise hands above head, take deep breath, lean forward…just about anything!
  - Consider need for thrombolytic agent (t-PA)
Troubleshooting Occlusions

- Obtain order for t-PA instillation to lumen(s) if flow is sluggish or blood return is absent.
- If t-PA unsuccessful after second instillation, notify provider and consider repeat CXR and/or IR referral for dye study.
- Prevention of occlusion is key!
  - Push-pause or pulsatile flush technique
  - Increased saline flush volume after blood draws
  - Flush immediately after infusions or blood draws are completed
- Refer to Nursing Policies and Procedures Trove 05-03-09
Tissue Plasminogen Activator
t-PA (Alteplase)

- Refer to MGH Medication Manual (see “Alteplase”)
- Provider order and EMAR documentation required; separate t-PA order needed for each lumen
- IV nurses instill t-PA into PICCs; t-PA instillation to all other CVADs is responsibility of unit RN
- Dosage: (per lumen)
  - for patients weighing > 30kg (66lbs): 2mg/2ml
  - for patients weighing < 30kg (66lbs): 110% of internal lumen volume of catheter (up to 2mg)
- Diluent: 2.2ml sterile water without preservative in a 10ml syringe
- Do NOT clamp catheter while t-PA is instilled
- Minimum dwell time of 30 minutes; 60 minutes is often required
- Four hour t-PA infusions may be required for significant fibrin sheaths causing withdrawal occlusions
Fibrin Sheath

Catheter thrombosis in subclavian vein


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Pinch-off Syndrome

- Compression of the catheter between the first rib and the clavicle
- Can lead to intermittent compression or catheter fracture

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Retrieved 12/29/09
file://www.uam.es/.../journals/ija/vol4n2/q&a14.htm
Pinch-off Syndrome

- Signs of Pinch-off:
  - Withdrawal Occlusion
  - Resistance to infusion of fluids
  - Patient position changes are required to infuse/withdraw from port (e.g. raise arm, trendelenburg)

- Follow diligently secondary to risk of catheter fracture/shearing

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Miscellaneous Information
Related to peripheral and central IV access
Filters

- Air-eliminating: 0.2 micron
- TPN: 1.2 micron (exception: pedi uses a 0.2 micron filter)
- Blood products: 170 micron filter on blood set tubing
- Mannitol: 1.2 micron
Patent Foramen Ovale (PFO) Filters

- PFO: opening between right and left atria
- Air-eliminating filter 0.2 micron
- Some medications should NOT be filtered; ex.- amphotericin
- NOT for use with blood transfusions
- Check priming volume
- Should be changed every 96 hours
- Placed ‘closest to insertion site’; i.e., on device
References

- Bard Access Systems-Ports- MRI Implanted Ports Copyrights 2005 C.R. Bard Inc

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PLEASE NOTE...

- All information provided is subject to review and revision. Please continue to refer to MGH Policies and Procedures in Trove as your primary resource.