

Nursing Management of Venous Access Devices: *Complications and Troubleshooting*

Mimi Bartholomay, RN, MSN, AOCN
Denise Dreher, RN, CRNI, VA-BC
Theresa Evans, RN, MSN
Susan Finn, RN, MSN, AOCNS
Debra Guthrie, RN, CRNI
Hannah Lyons, RN, MSN, AOCN
Janet Mulligan, RN, MS, VA-BC
Carol Tyksienski, M.S., R.N., N.P.

The Three Biggies.....

➤ Phlebitis



➤ Extravasation



➤ Infiltration



Dilantin extravasation

Images retrieved from www.iv-therapy.net 10/6/09

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)



Images retrieved from www.IV-therapy.net 10/6/09

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



Image retrieved from www.IV-therapy.net 10/6/09

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

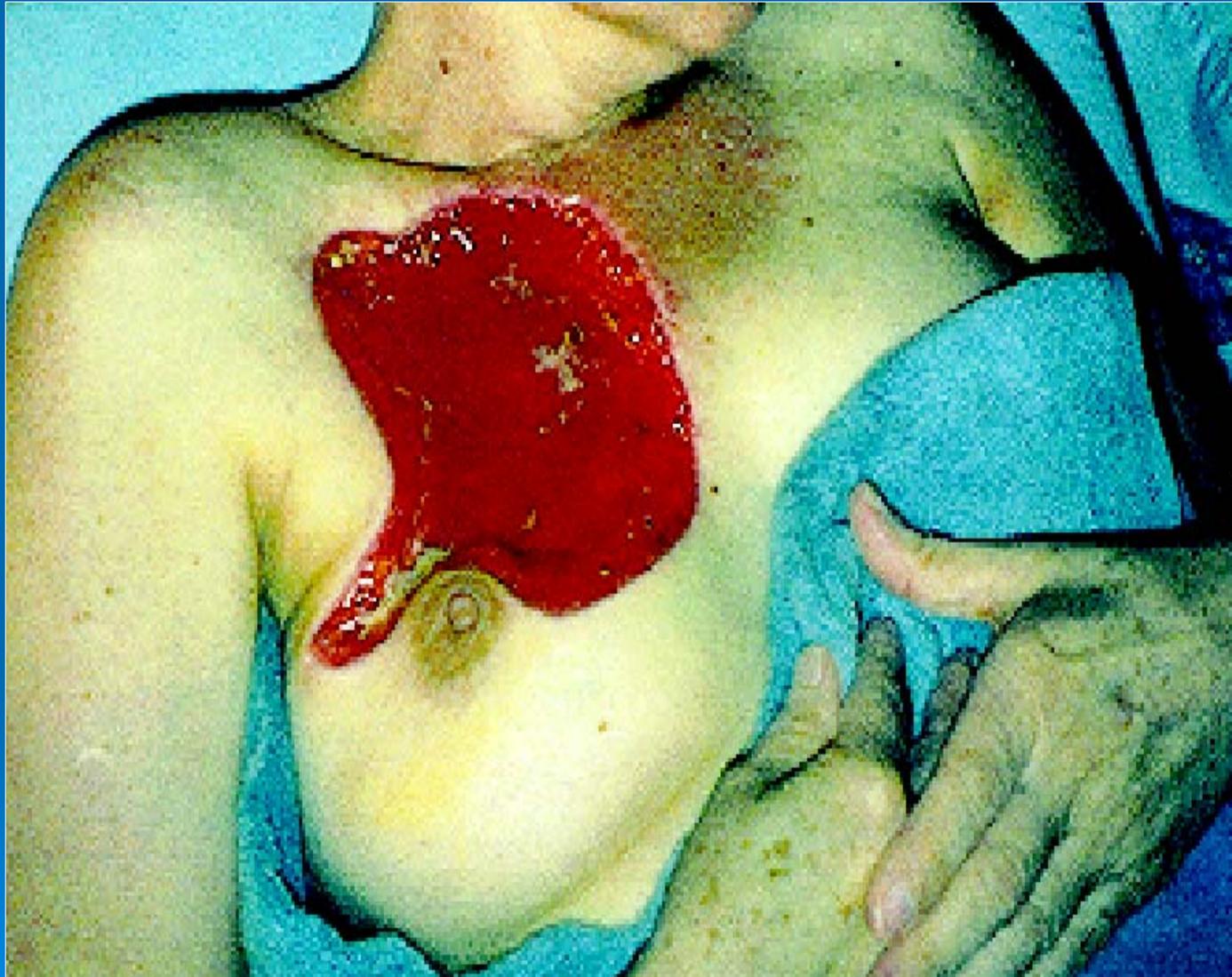
➤ Post extravasation care:

- 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



Used with permission from Lisa Schulmeister 1/2011



Used with permission from Lisa Schulmeister 1/2011

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)

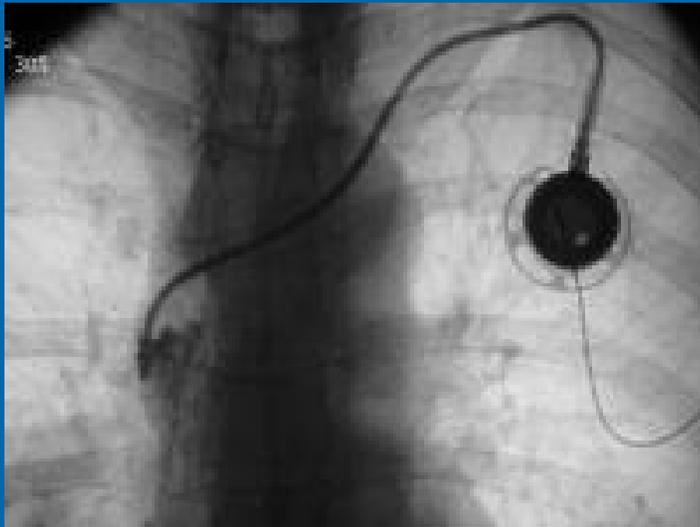
Troubleshooting Occlusions

- 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



Retrieved 9/25/09 from
http://www.imedicine.com/search_results.asp?start=21#Multimediamedia



Catheter thrombosis in subclavian vein

Retrieved from www.IV-therapy.net 10/6/09

Pinch-off Syndrome

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

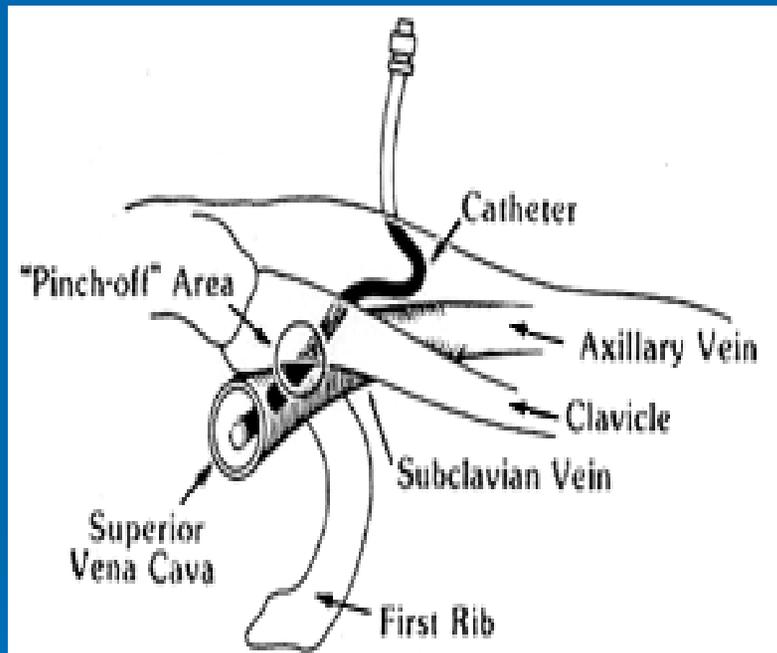


Used with permission from Olivier

Wenker, MD, MBA, DEAA Retrieved
12/29/09

[file:///www.uam.es/.../journals/ija/vol4n2/
q&a14.htm](file:///www.uam.es/.../journals/ija/vol4n2/q&a14.htm)

Pinch-off Syndrome



- Retrieved with permission 12/23/09
http://www.bardaccess.com/pdfs/ifus/0720656-5565120_Brevia_IFU_web.pdf

- 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

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
<http://www.bardamless.com/port-mri-port.php>
- Bard Access Systems-Ports- MRI Implanted Ports Copyrights 2005 C.R. Bard Inc
<http://www.bardamless.com/port-mri-port.php>
- Cope, D., Ezzone, S., Hagle, M., Mmlorkindale, D., Moran, A., Sanoshy, J., Winkelman, I., and Camp-Sorrell, D. (editor)(2004) Access Device Guidelines: Recommendations for Nursing Practice and Education, 2nd ed. Pittsburgh: Oncology Nursing Society.

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