Venous Access Devices: Types, management and triaging common complications

Catherine Saltalamacchia, NP, VA-BC
Melissa Chittle, PA-C
Disclosure of relevant financial relationships:

No financial relationships to disclose

Disclosure of off-label and/or investigative uses:

Will not discuss off label use and/or investigational use
Agenda/Objectives

1. Types of venous access devices
2. Indication for and maintenance of venous access devices
3. Triaging common venous access device complications
Venous Access Device Background

- 5 million central venous catheters placed annually (41% in oncology patients)

- Reliable venous access cornerstone of safe/effective care in pts requiring repeated venipuncture

- Many options available depending on indication, patient, infusate, duration

- Complications, morbidity, mortality associated with these devices

- Knowing how to select device, maintain it and manage complications is imperative in preventing costly adverse events
Types of Venous Access Devices

- Peripheral IV Catheter (PIV)
- Peripheral Inserted Central Catheter (PICC)
- Implanted Port (Port)
- MidLine (ML)
- Nontunneled Central Venous Catheter (CVC)
- Tunneled Central Venous Catheter (CVC)
5 Things To Consider when Selecting a Venous Access Device

• Duration of treatment
• Indication
• Nature of medication/infusate (peripherally vs non peripherally compatible)
• Patient characteristics
• Device characteristics
Peripheral IV

Appropriate
• Use <6 days
• In emergency situation jugular/foot ok
• Single blood transfusion
• Contrast injection

Inappropriate
• Routine placement at the time of hospitalization without clinical indication
• Removal based on routine schedule in absence of clinically concerning symptoms
• Do no need to remove if placed in the field in absence of clinically concerning symptom
• Placement on same side as breast surgery, axillary lymph node dissection, AV fistula
Midline (not a central line)

- Inserted in veins above antecubital fossa and resides in basilic, brachial or cephalic vein terminating just short of the subclavian vein, distal to the axillary veins/shoulder and does not enter the central veins.
Midline

Appropriate:
• Use 6-14 days (approved for up to 4 weeks)
• Frequent phlebotomy
• Difficult venous access
• Antimicrobials
• Fluid replacement
• Analgesics
• Favorable outcomes and cost savings in critical care patients who have higher risk of infection, thrombosis, hemodynamic instability

Inappropriate:
• Continuous vesicant therapy
• Parenteral nutrition
• Irritants/vessicants/chemotherapy
• CKD
Midline

Care/Maintenance Tips

- Site assessments daily
- Flush with syringe > 10ml
- Push/pause flushing technique
- Do not flush against resistance
- Heparin 10 units/ml, 3-5ml every 12 hours. (10 ml of 0.9% preservative-free sodium chloride if heparin sensitivity)
- Dressing changes weekly or as needed if wet, soiled, loose
- Transparent dressings after initial 48 h (if gauze dressings change q 2 days)
- Chlorhexidine impregnated sponge at insertion site
- No instillations of t-PA for line occlusion as midline is not a central line
Central Venous Catheters

Tip Location

- The cavoatrial junction (CAJ) is the preferred anatomic landmark to describe the location of central venous catheter tips. *JVIR 2008; 19:359-365*

- CAJ has been defined as 2 vertebral body units below the carina *JVIR 2010;21:976-981*

- The dialysis catheter tip should be located in RA to ensure optimal blood flow. *National Kidney Foundation Kidney Disease Outcome QI (NKF KDOQI) Guidelines 2006*
Peripherally Inserted Central Venous Catheter (PICC)

Appropriate:

- Infusion /peripherally compatible infusate > 14 days
- Patient with difficult venous access requiring venipuncture > 14 days
- Irritants/vesicants any duration
- Frequent phlebotomy > 6 days
- TPN any length of time
- Chemo prefer if < 3 mo due to increased thrombosis/infections risk in patients with cancer
- Invasive hemodynamic monitoring in critically ill pt >15 days
- Coagulopathy, severe/prolonged thrombocytopenia
- Residing in skilled nursing facility given variable resources/challenges obtaining venous access
- Palliative/end of life care
- Transitioning from hospital to home

Inappropriate:

- Stage 3b or > CKD (GFR <45) as imperative to preserve central and peripheral veins for HD, AVF, grafts
- Bacteremia, ideally 48 hours negative blood cultures
- Corded venous segment, open wound, burn, below the elbow, immobile arm
- Infusion <5 days (unless irritant/vessicant)
- Multiple lumens “just in case”
- Hemodynamically unstable pt in ICU
- Removal in febrile pt without objective evidence of catheter associated blood stream infection
Peripherally Inserted Central Venous Catheter (PICC)

**Maintenance/Care Tips**

- OK for tip to be at lower 1/3 SVC, CAJ, or RA
- Sterile gauze 1-2 days following placement, clear transparent dressing q 7 days unless soiled
- Single lumen preferred
- Exchange over guide wire if dislodged. Do not advance
- Normal saline rather than Heparin flush appropriate
- If no longer functional try TPA/cathflow twice (30 min each time), position changes and if no improvements exchange over guide wire
- Do not recommend if UE DVT within 30 days
- In PICC related blood stream infection do not exchange, place new PICC after 48 hours negative blood cultures
- If not used for clinical reason > 48 hours consider removal
Non-Tunelled Central Venous Catheters

Appropriate
• < 14 days
• Hemodynamically unstable pts or actively receiving vasopressors
• Emergent/temporary ie. dialysis
• Harvesting stem cells (need larger bore then PICC)

Inappropriate
• Critically ill with DIC/coagulopathies (recommend PICC)
• Patients being discharged from hospital setting
• Thrombosis in IJ where venipuncture planned
Non-Tunelled Central Venous Catheters

Maintenance/Care Tips

- Can be removed easily by trained providers, does not require trip back to IR
- Can be exchanged easily for tunneled catheter in IR if desire for more permanent VAD
- Minimum number of lumens required for treatment

Department of Radiology
Tunneled Small Bore Central Venous Catheter

Appropriate
- Use > 31 days, preferably > 3 mo
- TPN, irritants, vesicant any length of time
- Frequent phlebotomy/difficult venous access > 31 days
- Best device if multiple/frequent infusions required as have lowest risk for complications
- Patients with CKD requiring > 5 days therapy/non peripheral compatible drug
- Lifelong access/repeated venipuncture or frequent (> 6) hospitalizations/year

Inappropriate
- Coagulopathy, severe/prolonged thrombocytopenia, anticoagulation/antiplatelet regimen that can not be interrupted (recommend PICC)
- Bacteremia (blood cultures negative 48 h)
- Multiple lumens “just in case”
- Hemodynamically unstable pt in ICU
- Removal in febrile pt without objective evidence of catheter associated blood stream infection
Tunneled Large Bore Central Venous Catheter (Aphaeresis and Dialysis)

Appropriate
• Dialysis/Apheresis
• Can place in setting of dual ASA/Plavix

Inappropriate
• Bacteremia
• Hemodynamically unstable pt
• Removal in febrile pt without objective evidence of catheter associated blood stream infection
Port-a-Catheters

Appropriate

- Use > 31 days and ideally > 6 months
- Irritant, vesicant, chemotherapy
- Episodic infusions
- Difficult venous access
- If PICC line not suitable (no suitable vein or insertion site, recent upper extremity DVT within 31 days)
- Indefinite venous access
- Frequent (> 6) hospitalizations/year

Inappropriate

- Obtaining frequent blood samples
- Two lumens “just in case”
- Bacteremia (> 48 h negative blood cultures)
- Hemodynamically unstable patient
- Removal in febrile pt without objective evidence of catheter associated blood stream infection
- *TPN (tunneled small bore recommended)
Port-a-catheters

**Maintenance/Care Tips**

- Before a device is used for the first time, both the type of device and catheter tip placement must be verified.
- Power-injectable ports have “CT” visible in the radiographic image.
- Access with non-coring huber needle and ensure not too long (displacement/infiltration) or too short (infiltration).
- Needle rotation “face of a clock” avoids erosion.
- 5 ml (100 unit/ml heparin) flush q 6-8 weeks and emerging data suggesting NS OK.
- Wound dehiscence if placed within 2 weeks of Avastin.
- 18 fold increase in infection if placed in inpatient setting.
- Single lumen preferred over dual lumen (external catheter smaller, internal catheter larger).
- Do not access if signs of infection/hematoma.
Selecting a Venous Access Device: Treatment Duration

Infusion Therapy Vascular Access Device Guideline - Adult Patients Only

- **Patient requires IV therapy**
  - **If a patient requires a drug that cannot be peripherally administered** OR **if a patient is critically ill**
    - Less than or equal to 3 days: PLV (Peripherally Inserted Central Catheter)
    - 6-14 days: PICC or TUNN
    - 15-30 days: PICC or TUNN
    - 31 days but less than 6 months: PICC or TUNN
    - Greater than 6 months: Implanted subcutaneous port

- **Proposed Therapy Duration**
  - less than or equal to 3 days: PLV (Peripherally Inserted Central Catheter)
  - 6-14 days: PICC or TUNN
  - 15-30 days: PICC or TUNN
  - 31 days but less than 6 months: PICC or TUNN
  - Greater than 6 months: Implanted subcutaneous port

Refer to IR the following:
- 1) All Patients requiring Small Bore Tunneled Line or Port Placement
- 2) All Patients with proposed therapy duration greater than 6 months
- 3) All PICC placements for patients with the conditions below

Conditions:
1. Patients with a pacemaker/ICD implant within 3 months
2. Patients with the following bilateral (on both arms) conditions:
   - Mastectomy
   - Lymph node dissection
   - Radiation
   - Lymphedema
   - Avulsions/grafts
   - Pacemaker/ICD
   - Upper extremity of central BVT
   - Implanted port
   - Tunneled central line
   - Upper extremity infection
   - Burn/grafts
   - Recent humerus fracture

**Abbreviations**: CVC, Central Venous Catheter; PLV, Peripheral Intravenous Line; PICC, Peripherally Inserted Central Catheter; TUNN, Tunneled Small Bore Catheter

Notes: 1) Placing a Port solely for phlebotomy is inappropriate regardless of duration. 2) Consider using the ultrasound for placing PLV for patients with difficult venous access
### Selecting a Venous Access Device: Medication/Infusate

<table>
<thead>
<tr>
<th>Midline and Central Line Drugs - Adult Patients Only</th>
</tr>
</thead>
<tbody>
<tr>
<td>This table is a guide in selecting appropriate VAD for patients who will have infusates/Drugs for 5 days or greater - including for home infusion or transfer to SNF.</td>
</tr>
<tr>
<td><strong>Potential Midline Administration</strong> (Nonvesicant and Nonirritating and Isotonic and Final dextrose concentration &lt; 10% and Osmolarity &lt; 600 mOsm/L)</td>
</tr>
<tr>
<td>Amoxicillin-sulbactam (Unasyn®)</td>
</tr>
<tr>
<td>Cefazolin (Ancef®, Kefzol®)</td>
</tr>
<tr>
<td>Cefepime (Maxipime®)</td>
</tr>
<tr>
<td>Ceftazidime (Fortaz®, Tazidime®)</td>
</tr>
<tr>
<td>Ceftiraxone (Rocephin®)</td>
</tr>
<tr>
<td>Daptomycin (Cubicin®)</td>
</tr>
<tr>
<td>Ertapenem (Invanz®)</td>
</tr>
<tr>
<td>Hydromorphone (Dilaudid®)</td>
</tr>
<tr>
<td>Meropenem (Merrem®)</td>
</tr>
<tr>
<td>Morphine (Duramorph®, Infumorph®)</td>
</tr>
<tr>
<td>Methylprednisolone (SOLU-Medrol®)</td>
</tr>
<tr>
<td>Piperacillin-tazobactam (Zosyn®)</td>
</tr>
<tr>
<td>Tigecycline (Tygacil®)</td>
</tr>
<tr>
<td>Penicillin G</td>
</tr>
<tr>
<td>Phenytoin (Phenergan®)</td>
</tr>
<tr>
<td>Vancomycin (Vancocin®)</td>
</tr>
</tbody>
</table>

This drug table was developed in collaboration with MGH Pharmacy, Infectious Diseases, and Infection Control.
## Selecting a Venous Access Device: Peripherally compatible infusate

<table>
<thead>
<tr>
<th>Device Type</th>
<th>Proposed Duration of Infusion</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>≤5 d</td>
</tr>
<tr>
<td>Peripheral IV catheter</td>
<td>No preference between peripheral IV and US-guided peripheral IV catheters for use ≤5 d</td>
</tr>
<tr>
<td>US-guided peripheral IV catheter</td>
<td>US-guided peripheral IV catheter preferred to peripheral IV catheter if proposed duration is 6–14 d</td>
</tr>
<tr>
<td>Nontunneled/acute central venous catheter</td>
<td>Central venous catheter preferred in critically ill patients or if hemodynamic monitoring is needed for 6–14 d</td>
</tr>
<tr>
<td>Midline catheter</td>
<td>Midline catheter preferred to PICC if proposed duration is ≤14 d</td>
</tr>
<tr>
<td>PICC</td>
<td></td>
</tr>
<tr>
<td>Tunneled catheter</td>
<td></td>
</tr>
<tr>
<td>Port</td>
<td></td>
</tr>
</tbody>
</table>

### Appropriate Neutral Inappropriate Disagreement
Selecting a Venous Access Device: Non-peripherally compatible infusates

<table>
<thead>
<tr>
<th>Device Type</th>
<th>Proposed Duration of Infusion</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>≤5 d</td>
</tr>
<tr>
<td>Peripheral IV catheter</td>
<td>Appropriate</td>
</tr>
<tr>
<td>US-guided peripheral IV catheter</td>
<td>Neutral</td>
</tr>
<tr>
<td>Nontunneled/scute central venous catheter</td>
<td>Central venous catheter preferred in critically ill patients or if hemodynamic monitoring is needed for 6–14 d</td>
</tr>
<tr>
<td>Midline catheter</td>
<td>Neutral</td>
</tr>
<tr>
<td>PICC</td>
<td>Neutral</td>
</tr>
<tr>
<td>Tunneled catheter</td>
<td>Neutral</td>
</tr>
<tr>
<td>Port</td>
<td>No preference among port, tunneled catheter, or PICC for ≥31 d</td>
</tr>
</tbody>
</table>

IV = intravenous; PICC = peripherally inserted central catheter; US = ultrasonography.
Selecting a Venous Access Device: Difficult venous access access

<table>
<thead>
<tr>
<th>Device Type</th>
<th>Proposed Duration of Infusion</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>≤5 d</td>
</tr>
<tr>
<td>Peripheral IV catheter</td>
<td>No preference between peripheral IV and US-guided peripheral IV catheters for use ≤5 d</td>
</tr>
<tr>
<td>US-guided peripheral IV catheter</td>
<td>US-guided peripheral IV catheters preferred to peripheral IV catheters if proposed duration is 6–14 d</td>
</tr>
<tr>
<td>Midline catheter</td>
<td>Midline catheters preferred to PICC if proposed duration is ≤14 d</td>
</tr>
<tr>
<td>Nontunneled/acute central venous catheter</td>
<td>Central venous catheter preferred to PICC for use ≤14 d in critically ill patients</td>
</tr>
<tr>
<td>PICC</td>
<td>Disagreement on appropriateness of PICC for durations ≤5 d</td>
</tr>
<tr>
<td>Tunneled catheter</td>
<td>Tunneled catheter neutral for difficult IV access for use ≥15 d</td>
</tr>
<tr>
<td>Port</td>
<td></td>
</tr>
</tbody>
</table>

IV = intravenous; PICC = peripherally inserted central catheter; US = ultrasonography.
Selecting a Venous Access Device: Frequent phlebotomy

<table>
<thead>
<tr>
<th>Device Type</th>
<th>Proposed Duration of Infusion</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>≤5 d</td>
</tr>
<tr>
<td>Peripheral IV catheter</td>
<td>No preference between peripheral IV and US-guided peripheral IV catheter for use ≤5 d</td>
</tr>
<tr>
<td>US-guided peripheral IV catheter</td>
<td>US-guided peripheral IV catheter preferred if venous access difficult</td>
</tr>
<tr>
<td>Midline catheter</td>
<td>Midline catheter preferred to PICCs if proposed duration ≤14 d</td>
</tr>
<tr>
<td>Nontunneled/acute central venous catheter</td>
<td>Central venous catheter preferred to PICC for use ≥14 d in critically ill patients</td>
</tr>
<tr>
<td>PICC</td>
<td>Disagreement on appropriateness of PICC for durations ≤3 d</td>
</tr>
<tr>
<td>Tunneled catheter</td>
<td>Tunneled catheter neutral for difficult intravenous access for use ≥15 d</td>
</tr>
<tr>
<td>Port</td>
<td>Ports inappropriate for frequent phlebotomy, regardless of proposed duration of use</td>
</tr>
</tbody>
</table>

IV = intravenous; PICC = peripherally inserted central catheter; US = ultrasonography.
“Time Out” for VAD Selection

- Clinician directed time out in vascular access decision making
- Reflect on indication
- Reflect on appropriate device
- Consider patient risk factors
- Discussion with specialists (infectious disease, oncology, nephrology, pharmacist, interventional radiologist)
- Constantly reassess if VAD is essential vs non-essential
Central Line Associated Blood Stream Infection (CLABSI) Reduction

- 41,000 CLABSI annually in hospitals
- Aseptic technique & maximal sterile barrier precautions
- Select best insertion site to minimize infection (upper extremity vs femoral)
- VAD insertion checklists
- Personnel who are competent in insertion/maintenance
- Minimal access/frequency of handling and scrub port or hub with fraction prior to each use with antiseptic
- Minimum number of ports/lumens that are essential
- Biopatch (chlorhexidine impregnated sponge dressing) at insertion site/around access needle to provide continuous antisepsis
- Antiseptic impregnated caps

Based on 2011 CDC guideline for prevention of intravascular catheter-associated bloodstream infections:
https://www.cdc.gov/infectioncontrol/guidelines/bsi/index.html
Triaging and treating port problems

Infection
swelling
Bruising/hematoma
Line migration/port migration
Allergic reaction
Chemotherapy extravasation
Inability to Aspirate

- Fibrin Sheath formation
- Soft scar tissue build up causing inability to aspirate
Triaging Difficulty Flushing/Aspirating

Alteplase/CathFlo 2 mg Dose 1 /dwell for 30-120 minutes

Patency restored

NO

Alteplase/CathFlo 2 mg Dose 2 /dwell for 30-120 minutes
(Consider up to 72 hours)

Patency Restored

NO

Order Dye Study with Radiology

Fibrin Sheath

YES

Low dose thrombolytic infusion:
Mix 2mg tip/NS 250;
infuse 0.5mg per hour/per lumen (62.5cc/hr)

Patency Restored

NO

Contact IR for fibrin sheath stripping/replacement

YES

Resume Use

Obtain CXR

? catheter and reservoir intact
? breaks/kinks/detachment
? catheter tip location/migration
? unclear

YES

Replace Device
Next Steps

Poor Flow/No Blood Return

? Possible Mechanical Occlusion

Open clamps, check tubing kinks/twists, reposition patient/catheter, ask patient to cough/valsalva maneuvers change add on devices, caps, clogged filters verify needle placement, change needle

NO

Patency Restored

Able to flush/No blood return

? Possible Thrombotic Occlusion

? Possible Fibrin Sheath

NO

Not able to flush

? Malfunction

? Chemical Occlusion
# Catheter Occlusion

## Table 3. Degrees/Types of Occlusion

<table>
<thead>
<tr>
<th>Degree/Type of Occlusion</th>
<th>Symptoms/Signs</th>
<th>Causes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Partial</td>
<td>Decreased ability to infuse fluids into the CVAD; resistance with flushing and aspiration Sluggish flow through the catheter</td>
<td>Mechanical, chemical, or thrombotic occlusion</td>
</tr>
<tr>
<td>Withdrawal</td>
<td>Inability to aspirate blood but ability to infuse without any resistance Lack of free-flowing blood return</td>
<td>Mechanical or thrombotic occlusion</td>
</tr>
<tr>
<td>Complete</td>
<td>Inability to infuse or withdraw blood or fluid into the CVAD</td>
<td>Mechanical, chemical, or thrombotic occlusion</td>
</tr>
</tbody>
</table>

CVAD = central venous access device.
Source: Data from Baskin et al.\textsuperscript{23} and Cummings-Winfield and Mushani-Kanjil.\textsuperscript{28}
## CVAD Occlusion

### Table 5. Signs and Symptoms of CVAD Occlusions

#### Upon Infusion or Flushing

1. Resistance when flushing\(^{55}\)
2. Sluggish flow\(^{27,28,39,53}\)
3. Inability to infuse fluids\(^{26,27,53,56}\)
4. Frequent occlusion alarm on infusion pump\(^{27,39,57}\)
5. Infiltration or extravasation or swelling or leaking at the insertion site\(^{36,39}\)

#### Upon Aspiration of Blood

1. Inability to withdraw blood\(^{26,27,28,30,39,55–57}\)
2. Sluggish blood return\(^{28}\)
Treatment for Fibrin Sheath

**TRADE NAME:** Cathflo, Activase  
**PURPOSE:** Thrombolytic agents t-PA are indicated for the restoration of function to central venous access devices as assessed by the ability to withdraw blood and/or infuse fluids.

A prescriber’s order is required for t-PA  
Dosage for treating central venous catheter occlusion:

- In patients > 30 kg (66 lbs): 2mg (2ml) per lumen; may instill a second dose if catheter remains occluded.
- Instillation of t-PA for adult patients should always be the entire 2ml per lumen, nothing less, regardless of catheter lumen size.

---

Table 6. Pediatric Dosing of Alteplase

<table>
<thead>
<tr>
<th>Patient Weight</th>
<th>Alteplase (Thrombolytic) Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 30 kg</td>
<td>110% of fill volume</td>
</tr>
<tr>
<td>More than 30 kg</td>
<td>2 mg/2 mL</td>
</tr>
</tbody>
</table>

Source: Data from the Cathflo Product Monograph.65
Positioning is Everything

Presentation
Left IJ 8fr power port unable to draw blood
CXR shows kinked port at connector

Treatment
Required replacement
Malposition
Ventricular Catheter Position

Power port catheter tip in right ventricle

Snare technique to trim Dr Irani
MGH IR developed
Tilted Port

Presentation
Large habitus patient sleeping right lateral decubitus position
Port tilted/difficult to access

Treatment
Attempt to flip port
Port replaced with wide base power port
Swelling

**Presentation**
Right neck/arm swelling on side of port
Facial/eyefullness/puffiness
New collateral varicosities
arm/chest

**Treatment:**
Duplex ultrasound to r/o DVT
Anticoagulation for 3 mo for provoked DVT
May continue to use port
Do no need to remove port unless remains symptomatic after 72 hours therapy
Infection

• **Categories of Infection**
  - Catheter colonization
  - Catheter related blood stream infection-CLABSI
  - Exit site/Pocket infections
  - Stitch Erosion

• **Incidence**
  - Relatively low rates of 0.1% to 1.6% per 1000 catheter days

• **Pocket infection rates 0.8%-2.5%**

Risk Factors

Modifiable
- Multiple punctures
- Needle malposition/extravasation
- Use of TPN
- Frequency of handling*

Non Modifiable
- Age
- Hematologic malignancy
- Solid Tumor
- Transplant
- Neutropenia
- Thrombophillia/coagulopathy/hematoma
Infection
Soft Tissue and Pocket Infection
Signs and Symptoms

Drainage/pus = pocket infection
Pain/tenderness
Erythema
Induration
Warmth
Fluctuance
Malaise
Causative Organisms

**CLABSI**
Coagulase negative staphylococcus

**Pocket/Exit site**
Staphylococcus aureus
Staphylococcus epidermidis
Streptococcus species

Decision To Treat

- Clinical appearance - mild/severe
- Overall health status - frail/elderly
- Neutropenia
- Chemotherapy - nadir
- Treatment plan chemo break/near completion?
- History of difficult access/multiple ports
Treatment

- Get wound Culture
- Blood cultures only if concern for catheter associated blood stream infection
- Oral Antibiotics:
  - Keflex 500mg QID
  - Bactrim DS BID
  - Augmentin 500 BID
- Port rest period- do not access
- IV antibiotics: Medical/ID service collaboration, may need inpatient treatment
- Close surveillance/demarcate area
Indication for Removal

- Bacteremia* Discuss with ID as can attempt salvage/alcohol/antibiotic locks
- Infection known to be staph aureus
- Obvious purulence
- S/S sepsis, fever, chills, WBC
- Have a low threshold to remove if unclear or unsure
Port removal

- Debride & flush
- Interrupted subcutaneous *Vicryl if clean*
- If necrotic/purulence healing by secondary intention
  - First (only) packing *Iodoform* gauze qod
  - Replace NS wet to dry QD or BID
Suture Erosion

- Localized typically along suture line or venotomy site
- Redness
- Inflammation
- Suture visible/palpable
- Skin opening around knot/wound dehiscence
- Pt reports “snaring on clothes, pulling sensation, sees or feels something sticking out”
- Can be absorbable (occurs within 90 days) or non-absorbable suture (occurs anytime)
Suture migration/incision dehiscence
Treatment

Trim stitch as close to skin as possible to permit absorption
Allow body to absorb the stitch on its own
Avoid digging out, can cause wound to open
No steri strips recommended to avoid trapping bacteria
If suture line dehiscence exposed MUST remove port
Allergens/Irritants

**Allergic:**
Substance triggers an immune response/reaction in the skin
May occur suddenly or after several months/years of exposure
Likely lasts for life

**Irritant:**
Substance causes damage to the skin
Allergic Contact Dermatitis

Often delayed, appearing 24-48 hours

Appearance:
- Red bumps, papular, moist, weeping blisters/vessicles
- Warmth, tender
- Clear serous oozing, drainage, crusting well demarcated distribution
- Become scaly, raw or thickened
- Painful/itching
Common Allergens

Adhesives: steri strips, transparent dressings
Topical antibiotics: polymyxin, bacitracin
Rubber: latex
Soaps/cleansers: chlorohexidine, iodine
Common Irritants

Cements/adhesives/benzoin
Rubber gloves
Chemotherapy
Soaps/cleansers
Long term moisture
Alcohol wipes
Common skin reactions/irritants

Transparent dressings

Benzoin
## Dermatitis Treatment

### Allergic Contact Dermatitis

(T-cell mediated hypersensitivity reaction to exogenous substance)

- Identify and eliminate offending agent
- Mild soap/warm water
- Soothing calamine, colloidal oatmeal compress, warm or cool compress
- Low potency topical hydrocortisone based ointment or lotion
- Antihistamine/benadryl prn
- Rest port until resolves

### Irritant Contact Dermatitis

(Irritant causes physical, mechanical, chemical irritation of skin, barrier disrupted and inflammation develops)

- Fair skin higher risk
- Can occur with single or multiple exposures
- Decrease exposure to soap water
- Increase use of emollients
- Corticosteroid ointments under occlusion
Device Erosion
Erosion

Port visible beneath skin
Can occur at any point, typically with thin pt, weight loss, longer port dwell time, palpation ports, long periods of access, multiple access, failure to rotate needle access
Recommend removal
Extravasation

Port placement and same day chemotherapy

- Abrasion, bruising, ? extrav
- Clindamycin 7 days
- Dressing
- Limit lifting > 10 pounds
Extravasation

Port intact, bruising /superficial abrasion

Abrasion healing
Bruising

1 day S/P basilic vein arm port placement

1 week S/P basilic vein arm port placement
Patient Risk Factors for Hematoma

**Congenital/inherited disorders**
- Thrombocytopenia aplastic anemia
- Von Willebrand's (most common inherited bleeding disorder)

**Clotting disorders**
- Hemophilia, Factor VIII deficiency, Hemophilia B (factor IX deficiency)
- Leiden factor V, Lupus anticoagulant, Protein C/S deficiency

**Medications**
- Anticoagulation/antiplatelet agents

**Renal disease/Hepatic disease**

Department of Radiology
Port Pocket Hematoma

There is little clinical research available on chest port hematoma. Hematoma is a common complication of percutaneous chest port placement with an incidence of 0-4.5%.

- Cardiac literature, study of 3,164 pectoral pacemaker pockets hematoma incidence as high as 4.9%. Prolonged hospitalization 2%.

How to identify pocket bleeding

- Ecchymosis
- Pain and swelling
- Disfigurement of the skin
- Expanding hematoma
- Taut skin/wound dehiscence
Hematoma
hematoma
Small bore tunneled Catheter

Right jugular access
High puncture, in setting thrombocytopenia
Hematoma at the venotomy
### Risk Reduction Strategies

**Correct abnormal labs**
- Transfuse if necessary per guidelines
- Vasopressin, FFP for hepatic dysfunction

**Anticoagulation hold peri-procedurally**
- Train patients on anticoagulants to hold manual pressure 10 minutes over reservoir after every puncture
- Limit number access attempts

**Choose low profile**
- Single vs. double
- Low profile

**Consider use of:**
- Lidocaine w/ epinephrine
- Intraprocedural electrocautery
- Injectable collagen coagulants such as *D-stat*
SIR Guidelines for Vascular Access Device Placement/Removal

Testing
- INR
- APTT in patients receiving IV Heparin as patients have 5-10 fold increased risk of bleeding with heparin then any other anticlotting medication

Not Recommended
- Platelet count
- Hematocrit

Management
- INR: ≥1.5 although INR <2 relatively safe
- APTT: no consensus at correcting values >1.5 x control, 73 % consensus
- Platelet: correct if < 50,000
- Hematocrit: no consensus, per clinical indication

Patel, Indravadan MD, Davidson, Jon C. MD, Nikolic, Boris, MD, MBA, Salazar, Gloria, MD, Marc S. Schwartzberg, MD T Gregory Walker, MD and Warel A Saad, MD for the Standards Of Practice Committee and Cardiovascular And Interventional Radiological Society of Europe
# Anticoagulation/Antiplatelet Holding Guideline

<table>
<thead>
<tr>
<th>Medications</th>
<th>Category 1 Low risk bleeding procedure</th>
<th>Category 2 Moderate risk bleeding procedure</th>
<th>Category 3 High risk bleeding procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ibuprofen</td>
<td>Proceed</td>
<td>Proceed</td>
<td>Proceed</td>
</tr>
<tr>
<td>Aspirin (81 or 325mg)</td>
<td>Proceed</td>
<td>Proceed</td>
<td>Proceed</td>
</tr>
<tr>
<td>Clopidogrel (Plavix)</td>
<td>Proceed</td>
<td>Hold 5 days prior to procedure</td>
<td>Hold 5 days prior to procedure</td>
</tr>
<tr>
<td>Heparin IV</td>
<td>Stop infusion 60 minutes prior to procedure</td>
<td>Stop infusion 60 minutes prior to procedure</td>
<td>Stop infusion 60 minutes prior to procedure</td>
</tr>
<tr>
<td>Prophylactic LMWH</td>
<td>Proceed if no renal failure (Cr &lt; 3); otherwise, discuss with IR</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Therapeutic LMWH</td>
<td>Proceed if no renal failure (Cr &lt; 3); otherwise, discuss with IR</td>
<td>Hold 2 doses (24 hours) prior to procedure</td>
<td>Hold 2 doses (24 hours) prior to procedure</td>
</tr>
<tr>
<td>Fondaparinux (Arixtra)</td>
<td>Proceed</td>
<td>Hold 72 hours prior to procedure</td>
<td>Hold 72 hours prior to procedure</td>
</tr>
<tr>
<td>Warfarin (Coumadin)</td>
<td>Proceed if INR ≤ 2.5 (must be documented within one month)</td>
<td>Hold 5 days prior. Retest INR within 24 hours of procedure. Then, proceed if INR ≤ 1.7. Consider bridging therapy.</td>
<td></td>
</tr>
<tr>
<td>New Oral Anticoagulants (Pradaxa, Xarelto, Eliquis, Savaysa)</td>
<td>Proceed</td>
<td>Hold 72 hours prior to the procedure (CrCl &gt; 50 mL/min) or 3-5 days (CrCl &lt; 50 mL/min)</td>
<td>Hold 72 hours prior to the procedure (CrCl &gt; 50 mL/min) or 3-5 days (CrCl &lt; 50 mL/min)</td>
</tr>
</tbody>
</table>
Breast cancer is the most commonly diagnosed cancer in women and the second leading cause of death in women.

Cutaneous metastasis occurs in about 10% of patients, with a most distressing presentation.

This poses challenges for vascular access (often requiring creative placement of the port reservoir).
Removal/ Creative placement

Cutaneous lesions encompassing port

Power port body placed upper scapula
Interventional Radiology
617.726.8488

Catherine Saltalamacchia, NP (csaltalamacchia@partners.org)
Melissa Chittle, PA-C (mchittle@partners.org)
References


Consensus Guidelines for Coagulation Status and Hemostasis Risk, J Vasc Interv Radiology 2012;23:727
736 Patel, Indravadan MD, Davidson, Jon C. MD, Nikolic, Boris, MD, MBA,
Salazar, Gloria, M, MD, Marc S. Schwartzberg, MD T Gregory Walker, MD and Warel A Saad, MD for the Standards Of Practice Committee and Cardiovascular And Interventional Radiological Society of Europe

Suggested Guidelines for Anticoagulation and Neuraxial Anesthesia/Analgesia. Katharine Fleischmann, MD, MGH, Boston MA Jan 2008


Outpatient Placement of Subcutaneous Venous Access Ports Reduces the Rate of Infection and Dehiscence Compared with Inpatient Placement
Nirnimesh Pandey, MD, Jesse L. Chittams, MS, and Scott O. Trerotola, MD