Thrombotic and Non Thrombotic Catheter complication
Incidence

Thrombosis and non-thrombotic occlusion of CVC occur with approximately equal frequency.

Reported rates of 0.8 per 1000 catheter days for occlusion and 1.15 per 1000 catheter days for thrombosis.

5 million CVC 15 million catheter days yearly.
Catheter position

Up to 15% misplaced - More common with PICC Less with ports
Occlusion – The Kinked line Check list

• External Occlusion - Check for closed clamps
• Check for sutures at the skin site
• Examine the IV tubing and pump for blockage / malfunction
Occlusion – Internal Causes

- Internal Occlusion - harder to assess
- Check patient arm position
- Check CXR pinch off syndrome
- Catheter internal obstruction
Occlusion – Internal Causes II

- Catheter fracture – complication of pinch off syndrome
- Catheter migration / malposition 0.9-1.8% necklace sign
Occlusion – Internal Causes II

- Drug ppt phenytoin heparin-erythromycin
- morphine- proper flushing techniques 0.1N HCl
  8.4%NaHCO3 acid for acid base for base
- CA-PO4 ppt  L-cysteine 40 mg/g aa lowers pH
  HCL/0.1N HCl
- Lipid emulsions/fibrin-form wax 3:1 infusions
  use<24 hr 70% Etoh 0.1N NaOH
## Thrombosis: A host of risk factors

<table>
<thead>
<tr>
<th>Patient Factors</th>
<th>Hypercoaguable states</th>
<th>Increased</th>
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</thead>
<tbody>
<tr>
<td>Catheter type</td>
<td>PICC</td>
<td>Increased</td>
</tr>
<tr>
<td></td>
<td>Large lumen diameter</td>
<td>Increased</td>
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<tr>
<td></td>
<td>Closed or open ended</td>
<td>No difference</td>
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<tr>
<td>Insertion</td>
<td>Tip above SVC/RA</td>
<td>Increased</td>
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<tr>
<td></td>
<td>Left sided</td>
<td>Increased</td>
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<tr>
<td></td>
<td>Femoral</td>
<td>Increased</td>
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<tr>
<td></td>
<td>US guidance</td>
<td>No difference</td>
</tr>
<tr>
<td></td>
<td>Multiple insertion</td>
<td>Increased</td>
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</tbody>
</table>
Manifestations of CVC thrombosis

2/3 asymptomatic
Swelling of head- neck- limb
Jaw or shoulder pain
Localized pain numbness
Headache
Superficial venous distensions - Mondor disease
Inflammation phlebitis
Erythema of limb
Incidental CT finding
Types of thrombosis
Complications of Thrombosis

- Pulmonary embolism 10-15% – rarely fatal
- Loss of venous access 10%
- Post thrombotic syndrome – rare edema chronic pain
- Limb heaviness
- SVC syndrome – seen in Crohn's described in NEC
- Delays in treatment
CVC thrombosis prophylaxis

• No recommendation for anticoagulation though LMWH used in ICU
• WARP trial Low dose warfarin 1 mg day in malignancy with CVC compared to adjusted dose INR 1.5-2.0 to no AC Adjusted dose less CRT but increased bleeding
• Cochrane 2012 no benefit to anticoagulation but no increased bleeding risk
• Saline flushes in ICU may increase incidence of arterial line thrombosis
Diagnosis & Treatment of Catheter related Thrombosis

- Duplex U/S is best test in most cases
- Venogram – gold standard
- CVC - out high risk 3-5 days heparin/LMWH then 6 weeks warfarin /LMWH o/w just remove
- CVC-in 3-5 days heparin/LMWH then 12 weeks warfarin /LMWH/Factor Xa inh
- Line can stay well position/no infection/resolution of sxs with AC
Adjusted protocol for thrombocytopenia

>50 K full dose
25-50K 50% dose reduction
<25 K no anticoagulation
Consider
Thrombolytic therapy for intra catheter thrombosis

Urokinase approved since 1998 concern for infection risk pulled r-UK 72%
Alteplase t-PA 74% in 120 min
Reteplase 67-74% 30-40 min
Tenecteplase 81-87% 120 min
Alfimeprase 60% 120 min
tPA structures
Arterial puncture or cannulation at insertion

Arterial puncture occurs ~5% reduced with US guidance ~1.5%
Arterial cannulation 0.8%
Latter more serious assoc with CVA hematoma AV fistula
Removal of catheter with compression appears unsafe 47% complication
Surgical Repair or endovascular repair may be better option
Air embolism

Incidence up to 1/772
Pressure gradient between room air and lower or sub-atmospheric SVC pressures
Worsened by hypovolemia and inspiration
Symptoms: continuous cough, dyspnea, chest pain
Trendelenburg raises CVP pressure
Exhale at insertion and removal
PICC complications

First used in 1975
Thrombosis up to 5%
High vein to catheter ratio

Unique neurological complication:
Horners syndrome

Anterior interosseous nerve syndrome