Clinical Practice Guideline for Management of Mis-sited Central Catheters

Background:
This guideline is intended to provide a step-by-step management plan for mis-sited central vascular access devices based on available data for their prevention, diagnosis and management in order to minimise catheter-related complications. This Guideline should be used in conjunction with http://intranet.lothian.scot.nhs.uk/Directory/CriticalCare/Bedside care/Insertion and Care of Arterial and Central Venous Lines.doc

Advances in imaging and access techniques have reduced complications associated with central venous access. The most common complications remain:

1. Vascular Injury
2. Misplacement – often in an artery

The majority of misplaced catheters can be managed with minimal morbidity. However, this complication must be handled appropriately in order to avoid significant mortality and morbidity.

Potential Complications:
Minor **vein** wall tears are generally unrecognised during guidewire, dilator and catheter insertion. While these are usually without consequence, major bleeding can occur if the tear connects to a low pressure body cavity such as the pleural, peritoneal or pericardial space.

Inadvertent **arterial** puncture or cannulation may be complicated by arterial dissection, arterial thrombosis, embolus, uncontrolled haemorrhage, AV fistula formation or pseudoaneurysm. Unintentional cannulation can also result in distal ischaemic damage. Massive bleeding into body cavities may occur.

Recognition:
Patients at highest risk of unrecognised arterial puncture are hypotensive, hypoxic or anaemic.

Misplaced line should be considered if:

1. Guidewire will not advance freely/difficult insertion.
2. Central venous line does not aspirate or unable to infuse anything down it.
3. Line does not follow the expected course of central vein on CXR. For femoral lines, XR may be less helpful.
4. Arterial pressure bleeding or waveform
5. Retroperitoneal or major femoral haemorrhage is the most frequent complication of femoral cannulation.

Guidance for needle, wire, and catheter placement includes ultrasound imaging for the purpose of pre-puncture vessel localization (*i.e.*, static ultrasound) and ultrasound for guiding the needle to its intended venous location (*i.e.*, real time or dynamic ultrasound). Verification of needle, wire, or catheter location includes any one or more of the following methods:

1. ultrasound
2. pressure waveform analysis
3. venous blood gas
4. fluoroscopy

Blood colour or absence of pulsatile flow should not be relied upon for confirming that the catheter or thin-wall needle resides in the vein.

Immediate Care and Actions:

Arterial Puncture only, no dilator or catheter threaded, COMPRESSIBLE vessel: IF there is no major Coagulopathy, the needle is 18 gauge or less AND the vessel is compressible:

a. withdraw the needle
b. manual compression for at least 5 minutes.
c. continued observation for at least 24 hours

Dilator/catheter sited, significant Coagulopathy expected or NON COMPRESSIBLE vessel:

a. DON'T pull out catheter/dilator.
b. Leave the catheter/dilator in place and cap off until contact with vascular surgery.
c. Do not infuse anything down the catheter.
d. Contact Vascular Surgery via switchboard who will liaise with Interventional Radiology

Case reports of adult patients with arterial puncture by a large bore catheter/vessel dilator during attempted central venous catheterization indicate severe complications (*e.g.*,cerebral infarction, arteriovenous fistula, haemothorax) after immediate catheter removal; no such complications were reported for adult patients whose catheters were left in place before surgical consultation and repair.

When unintended cannulation of an arterial vessel with a dilator or large-bore catheter occurs, the dilator or catheter should be left in place and a general surgeon, a vascular surgeon, or an interventional radiologist should be immediately consulted regarding surgical or nonsurgical catheter removal for adults. Vascular imaging may be organised by way of CT angiogram or Duplex ultrasound. Management will be determined by site of injury, size (French size) of puncture and clinical context; and may be multidisciplinary.

After the injury has been evaluated and a treatment plan has been executed, the anaesthetist and surgeon should confer regarding relative risks and benefits of proceeding with the elective surgery *versus* deferring surgery to allow for a period of patient observation.

In general, most catheterisations of the subclavian artery will be manageable by percutaneous closure devices. Punctures of the carotid artery are more likely to require surgical closure.

Arterial puncture recognised
BEFORE DILATION

No Coagulopathy
present (or likely to develop)

Needle Size
Less Than or Equal to 18 gauge

Compressible Vessel*

- Remove needle
- Compress vessel for a minimum of 5 minutes
- Remain watchful for distal circulation issues, expanding mass, haemothorax, vascular instability

Communicate the issue and its management with patient or their representative as soon as is practically possible and document this in the notes

***There is anecdotal evidence in the literature from the pre ultrasound era, that compressing supra and infraclavicularly for a minimum of 5 minutes following small gauge needle puncture of the subclavian may be acceptable providing there is no coagulopathy and active observation of the patient is documented for greater than 24 hours.

Arterial puncture recognised
AFTER DILATION

DO
- Stop all infusions
- Cap line off
- CONTACT VASCULAR SURGERY

- Guidewire difficult or unable to thread
- 'Arterial' pulse or pressure
- Abnormal route of catheter seen on Xray

DONT

PULL and PRESS

Communicate the issue and its management with patient or their representative as soon as is practically possible and document this in the notes

References:

Practice Guidelines for Central Venous Access: *A Report by the American Society of Anesthesiologists Task Force on Central Venous Access Anaesthesiology,* Anesthesiology 2012; 116:539 –73 547

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