Mastery Learning Series

PICC line insertion-
Pre-course Material

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PICC line insertion- Pre-course Material

Learning outcomes:

By the end of this module you will be able to:
- Describe the indications and contraindications for PICC line insertion
- Explain the choice of PICC line type
- Describe the upper limb venous anatomy
- Demonstrate upper limb vascular sonoanatomy
- Apply ultrasound to identify anatomical variation in vascular anatomy
- Explain the risks and benefits of the procedure without jargon as part of informed (verbal) consent
- Demonstrate the Seldinger technique
- Apply PICC line insertion skills appropriately in the clinical setting
- Understand ongoing PICC line care, and be able to explain it to your patient

Indications

- Lack of peripheral access
- Infusion of inotropes
- Infusions of vesicant, irritant, parenteral nutrition or hyperosmolar solutions
- Long-term (>10 days) venous access required

Contraindications

- The inability to locate suitable vein
- Anatomical distortion from surgery or trauma
- Patient is unsafe to have a central venous access device (e.g. from agitation)
- Patient refusal
- Local sepsis
- Thrombosis
- IV access only required for 7 days or less
Anatomy

Fig 1. Upper limb venous anatomy [1]

Vessel Selection

Right arm preferable to left (as the catheter is more likely to advance into the correct vessel), vessel selection in order:
1. Basilic
2. Brachial
3. Cephalic

Pre-procedure

*Patient information and consent*
Purpose of procedure, risks, benefits, alternatives.

*Line care: Consider using local patient information leaflet as available*
Keep the line clean and covered when not in use. Avoid getting the line or dressing wet, and avoid pulling on line.

*When to seek help:*
- Oozing from the insertion site
- a temperature of 38°C, fever and chills especially right after the line is flushed with saline
- Leaking or cracked line
- Pain and swelling of the arm, neck and/or chest
- Catheter appears longer than when first inserted and you can see more of the line
- Redness and inflammation of the insertion site

Line removal – a nurse will remove the PICC line when it is no longer required, and apply a dressing.

Types of PICC Lines

PICC lines are described by their gauge, number of lumen, and if they are valved (no clamp) or open ended (with clamp). The indications for different line types vary between centres. Whenever TPN is used a dedicated lumen must be used.

<table>
<thead>
<tr>
<th>Type</th>
<th>Use</th>
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<tbody>
<tr>
<td>Valved</td>
<td>Chemotherapy, less risk of air embolus</td>
</tr>
<tr>
<td>Double lumen</td>
<td>TPN, where a second lumen is required for other IV therapy</td>
</tr>
<tr>
<td>Single lumen</td>
<td>Everything else</td>
</tr>
</tbody>
</table>

PICC line or Mid line?

The indication for the intravenous line will determine the desired position of the tip. If irritant fluid is to be administered (e.g. TPN) then the tip should sit in the superior vena cava. This is a PICC line, and the length should be measured from the skin insertion point to the sternal notch using the tape measure (typically 32-42cm). If the line is to be used for non-irritant fluids (e.g. antibiotics) the line should be cut so that the tip is positioned in the arm (10-15cm). Many centres will use a Mid line in this instance.

Equipment

You will need an assistant, and the following:
- PICC line pack
  - Catheter
  - Introducer needle
  - Peel-away sheath
  - Guidewire (size 018)
  - Tape measure
  - Scalpel
- Sterile dressing pack
- Sterile drape
Procedural notes:

When inserting the needle into the vein, do not apply a syringe to the needle, aspiration will collapse the vein, in contrast to CVP line insertion

Secure line to skin with statlock or securacath. Lines should not be sutured.

For line tip positioning see questions below. If the line is misplaced, discuss with radiology to consider resiting with screening.

Procedure

A. Preparation, Assistance and Positioning
   1. Position arm on absorbent drape
   2. U/S scan, identify brachial artery and suitable veins
   3. Choose insertion site measure from insertion site to external location of line tip

B. Asepsis + Anaesthetic
   1. Sterile preparation of operator and patient with full aseptic technique
   2. Prep line – cut to length as appropriate and flush lumens with sterile saline
   3. Sub cutaneous lidocaine infiltration

C. Procedural Pause - 3 Point Check
   Ensure patient, assistant and clinician prepared to proceed

D. Insertion
   1. Insert the needle into the vein under US guidance
   2. Insert the wire through the needle into the vein
   3. Release tourniquet
   4. Remove the needle over the wire, holding on to the wire at all times
   5. US to confirm wire in vein
   6. Insert peel away sheath over wire
   7. Remove wire and introducer of peel away sheath
   8. Advance line to appropriate length through the peel away sheath
   9. Incrementally remove peel away sheath
   10. Check aspiration and flush all lumens

E. Anchoring + Dressing
   1. Secure line to skin
   2. Apply sterile dressing
3. Lock line with appropriate fluid if necessary

F. Completion

1. Document procedure in notes, recording length in vein, length outside vein, and insertion vein
2. Organise check chest X-ray
Questions

1. List 2 indications and 2 contraindications for PICC line insertion.

2. For the following scenarios give the order of vein preference:
   a. A 50 year old woman undergoing chemotherapy for previous right sided breast cancer with prior wide local excision and axillary node clearance.
   b. A right-hand dominant 62 year old male with stage 4 renal failure and septic arthritis of the knee.

3. Select the appropriate line for the following:
   - IVDU with staph aureus bacteraemia
   - A patient with post-operative entero-cutaneous fistula and requirement for TPN

4. List the equipment needed to perform a PICC line insertion.

5. Identify the line tip position on the following x-rays:
   a:
Answers

1. See text for indications/contraindications

2. In the context of previous breast cancer with axillary node clearance use the contralateral arm, unless no other choice. The order of preference would therefore be left basilica, left brachial, left cephalic, right basilic, right brachial, right cephalic.

The case of chronic renal failure and septic arthritis highlights the forward planning involved in choosing a suitable site. This patient may require a fistula (preferentially on the non-dominant side) with progression of their renal disease. Avoiding damage to this vessel is important. Therefore, the dominant side would be chosen for their peripheral line.

3. The IVDU with staph aureus bacteraemia does not require a long line and would be sufficiently treated with a midline or short PICC of around 15cm in length. This would mean that it is stable but not extending into the axillary vein.

The second case describes the need for TPN therefore accurate placement in the RA/SVC region is essential. With such a complex condition, additional IV therapy beyond TPN will undoubtedly be given, and so a dual lumen line is required.

4. PICC line pack, containing: Catheter, Introducer needle, Peel-away sheath, Guidewire, Tape measure, Scalpel.

And: Sterile dressing pack, Sterile drape, US machine and linear array probe, Sterile sheath for US probe, Sterile gel, Absorbent drape, Sterile gown, hat and sterile gloves, Cleaning fluid (chlorhexidine), 20 ml 0.9% NaCl flush, Suitable locking fluid, Means of securing line (e.g. statlock), Dressing.

5. a = SVC RA junction
   b = SVC
   c = RA

References