Safety in central venous line insertion within DCCM

Aim:

To reduce the rate of complications during the actual insertion of the CVL when done by DCCM staff.

Background:

On the background of increasing both numbers and medical complexities of patients admitted to the DCCM, the rate of CVL complications occurring during CVL insertion has been noted in the past 6 months. The aim of this proposal is to reduce these complications to minimize harm to patients.

Introduction

4 Major components have been identified as potential areas where we can improve complication rates during CVL insertion. This includes the following:

1. Trainee training and supervision
2. Identifying the difficult central line
3. Checks during the procedure
4. Confirmation of the central line position

Trainee training and supervision

1. All trainees not competent will be required to attend a teaching session in inserting CVL. This will generally be in the orientation, however, if this is missed, an individual session with an SMO/ experienced registrar would also suffice. The first insertion should be done via simulation by using the mannikin.
2. For the purposes of this document, an experienced registrar is defined as trainee who has had 2 years of ICU/anaesthesia experience, AND central line insertion is common in their practice.
3. A competent trainee is one who has done at least 10 CVLs independently and successfully.
4. All supervised insertion will require the use of the central line insertion checklist.
5. All trainees who are not competent shall require 3 consecutively successful CVL insertions that are supervised by either an experienced registrar or SMO. At the end of 3 consecutive CVLs, the trainee will require a final supervised insertion in the presence of a fellow/SMO for a final sign off.

Identifying the difficult CVL insertion

The preferred insertion site of CVL in DCCM is the right internal jugular, followed by the left and subsequently femorals. There are certain patient features would make insertion difficult and therefore increase the chance of complications:

1. Patients with known anatomical anomalies in their vasculature, such as congenital heart disease or those with corrective surgery

2. Patients with small internal jugulars AND they lie directly anterior to the internal carotid in the majority of the neck, i.e. they do not separate to side-to-side despite scanning the length of the neck
3. Where 3 attempts at inserting a CVL has occurred.

If the CVL is predicted to be difficult, please discuss with the duty SMO, or consider an alternative site such as the femoral vein.

Check points during the procedure

It is not the purpose of this document to run through the entire insertion procedure, but rather to highlight crucial points of the procedure that are essential to avoid complications.

1. **Identify the optimal position of the needle insertion:** The traditional position of CVL insertion is around the level of the cricoid. With the advent of the Ultrasound, it is possible to identify the safest venous puncture point, which is the point where the vein is lateral to the carotid, rather than directly anterior. However, if this point is too low i.e. below the level of the cricoid, the risk of pneumothorax increases. Remember the puncture point at the skin will be cephalad to the actual point of venous puncture, depending on the angle of your needle. For internal jugular vein insertion, the needle should be inserted slightly medially to the vein and aimed slightly laterally to avoid the carotid.
2. **Use short axis view:** The point of the USS is not to insert the needle at the exact point on the vein but rather, the point of the USS is to avoid carotid puncture. It is hard to achieve this if you cannot identify both the carotid and vein in the same USS image.
3. **Identify the end of the needle on USS**
4. **Once the wire has been inserted, do not let go of the wire until it is removed.**
5. **On insertion of the wire, you need to identify a named individual and say in effect "I have inserted the wire, could you please make sure that I state that the wire is out before the end of this procedure".**
6. **Identify with the ultrasound the wire in the vein down the length of the neck as much as possible.** If the wire cannot be identified, ask SMO/experienced registrar, but if in doubt, remove the wire.
7. **Check the blood aspirated. If bright red or pulsatile flush back despite seeing the wire in the vein, or you have doubts, then pressure transduce either the needle/syringe/catheter depending on the technique used.** This will require the nurse to get another set of pressure transducer setup.
8. **Document on the CLAB form that the wire is out (this is yet to be implemented).**

Confirmation of the central line position

Confirmation of the central line position in the upper body is done as a routine by a CXR. The CXR can be reviewed at the bedside, but should always be confirmed by a careful review using the desktop through the PACS imaging system.

If there is doubt to the position of the CVL on the CXR, the following can be done:

1. A blood gas of the central line can be done. Note that patients in extremis or that are hypoxic, arterial gas may be similar to venous and simultaneous samples from arterial line and CVL should be compared, or consider other confirmatory tests.
2. Transduction of the central line to check for arterial waveforms