Peripheral insertion of double-lumen longlines using the Seldinger technique in preterm newborns: experience in a tertiary neonatal unit

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Central venous access in extremely preterm infants is an essential part of neonatal care. The use of single-lumen peripherally inserted central catheters (PICC lines) continues to be common practice in neonatal intensive care units (NICUs). However, the use of a double-lumen longline can be beneficial and may reduce the need for additional venous access when delivering infusions such as medications, fluids and parenteral nutrition.

The use of the Seldinger technique to insert a percutaneous line has been practised in paediatric care for some time, but less so in neonatology. Its first use in neonates was described in 1995 by Valk et al[1] and subsequently in 2008 by Bueno et al.[2] The technique involves puncturing the desired vein (ankle, antecubital fossa, forearm, foot, etc) with a sharp hollow needle. A round-tipped guidewire is then advanced through the lumen of the needle, and the needle is withdrawn. A catheter or cannula is then passed over the guidewire into the vessel and the guidewire is withdrawn. Once blood aspiration is confirmed the catheter/cannula is fixed and secured.

Since the introduction of Microsite (Vygon), our neonatal unit has taken a proactive role in using the Seldinger technique as the preferred method for inserting double-lumen longlines in preterm babies of any gestation. We use the Microsite 2Fr introducer kit,[3] a dedicated introducer kit for the placement of neonatal longlines in the smallest of veins. The kit contains the following components:

- 24G needle with a 15° bevel angle, length 19mm
- symmetrical 20cm flexible nitinol guidewire
- 18mm peelable sheath/dilator assembly 2Fr.

Methods

The technique used in our tertiary neonatal unit is to insert a 24G peripheral cannula, followed by insertion of a guidewire from the introducer kit. The 24G cannula is then removed and a dilator in a cannula with a peelable sheath is threaded over the guidewire and inserted through the skin into the vein. The guidewire along with the dilator is then removed leaving the peelable cannula *in situ*. A polyurethane double-lumen central venous catheter for premature babies and neonates (Nutriline Twinflo longline by Vygon) is threaded through the peelable cannula into the vessel to the required length. The peelable cannula is then removed and the sheaths peeled away. The line is secured and an X-ray is taken to confirm optimal position.

Prior to introduction of this technique the practice on our unit was to insert a Premicath PICC line (Vygon) via a 24G Jelco (Smiths Medical) or Neoflon (Becton Dickinson) cannula, leaving the cannula attached to the distal end of the longline. This technique led to an extra piece of plastic that needing securing with film dressing to the fragile skin of the preterm infant along with the potential of residual blood remaining in the hub of the cannula, increasing the risk of infection.

Gestation	
23-25 weeks	5
25^{+1}-30 weeks	10
30^{+1}-35 weeks	4
35^{+1}-40 weeks	1
Designation of staff inserting the line	
Consultant	12
Senior registrar	2
Registrar	1
Advanced neonatal nurse practitioner	1
Senior house officer	4
Insertion site	
Ankle (saphenous vein)	13
Antecubital fossa	5
Forearm	1
Foot	1

TABLE 1 The patient group (n=20).

In practice, our team first attempts to insert the double-lumen longline using the introducer kit. If it is considered unsafe to do so (eg based on size of the baby or calibre of the veins or unsuccessful attempts) the team will revert to the more traditional method of using Jelco/Neoflon/peelable cannulas and insertion of a Premicath catheter.

We collected data for 20 longline insertions in a nine-month period (**TABLE 1**) when this technique was first introduced into our unit in 2015/2016. The technique was used by various medical staff demonstrating that this is a method of insertion which can be taught and rolled out to other staff on other units. The smallest baby that we performed the technique on was born at 23^{+4} weeks' gestation, weighing 595g.

When we first conducted our data analysis in 2016, our discussions with other tertiary neonatal units revealed that this practice was not widespread in the UK. We contacted 48 NICUs

caring for babies <1kg in the UK to evaluate the practice of inserting double-lumen longlines using the Seldinger technique. Of the 28 units that responded, only two units were using the Seldinger technique for line insertion. Eight units were using double and single-lumen lines inserted either via a splitable needle or Jelco/Neoflon (24G cannulas) and 18 units were inserting single-lumen lines only (Premicath 28G or Nutriline 24G) using Jelco/Neoflon.

A more recent survey carried out in 2020 involving 21 neonatal units revealed that more units are now changing their practice – we found that eight units were using the Seldinger technique to insert single or double-lumen lines.

Discussion and conclusion

Insertion of double-lumen longlines using the Seldinger technique and the introducer kit in preterm newborns has become embedded into our routine practice and is the method of preference for our longline insertions. All trainees who rotate to our unit are taught this technique at induction. It has enabled us to successfully insert double-lumen longlines in babies born as early as 23 weeks' gestation. We consider the technique easy to administer and the double lumen prevents trauma linked to repeated punctures and allows simultaneous administration of incompatible drugs or solutions.

We have not conducted a formal audit, but we have never encountered any major problems with this approach. On a few occasions, we have had difficulty in advancing the double-lumen line beyond the groin area, however, if it fails to advance after some manipulation, we remove it and replace it with a single-lumen line. We monitor and perform a prospective audit in order to try to reduce line sepsis and as such, longline insertions are tracked to ensure correct surgical aseptic, non-touch techniques are being followed. If any issues with insertion or complications were encountered, they would get captured and, similarly, we have a robust weekly incident reporting process that would pick up any equipment-related incidents.

With training, the technique can be performed by various neonatal staff, even though our survey shows that use of the Seldinger technique and double-lumen central lines is still not common practice in UK NICUs.

References

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3. **Vygon.** Microsite 2Fr introducer kit. Online at: https://vygon.co.uk/product/neonatology-and-paediatrics/cathetersintroducer