

Chapter 3

Peripheral Venous Cannulation

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Introduction

Peripheral venous cannulation is a procedure that is used to introduce a hollow cannula in the peripheral veins either for the purpose of giving medications or fluids intravenously or for the purpose of obtaining blood sample. The hollow cannula is inserted into the vein with a needle, following which the needle is removed and the cannula is retained in the vein. During this procedure blood can be withdrawn for sampling prior to connecting to an intravenous drip set. The venous cannula should be fixed to the site of insertion using adhesive dressing. Peripheral venous cannula is commonly made up of Teflon or polyvinyl chloride (PVC). The different forms of peripheral cannulae available today have an inbuilt protective mechanism to avoid needle stick injuries.

Applied Anatomy

The most common site for the insertion of the peripheral venous cannula is the dorsum of the hand into the dorsal venous arch. The other sites used are the area around the anatomical snuffbox, forearm, elbow crease, medial aspect of the ankle and dorsum of the foot. The upper limb is preferred compared to the lower limb due to better patient compliance.

The venous system of the upper limb consists of superficial and deep veins. The superficial veins are used for peripheral venous cannulation. They arise from the dorsal venous arch. Medially it gives rise to the basilic vein while antero-laterally the cephalic vein is formed. Both these veins travel along the length of the forearm as they travel from the dorsal surface to the ventral surface. At the elbow both the veins communicate with each other through the median cubital vein. In the arm the basilic vein combines with the brachial veins to form the axillary vein. The cephalic vein travels along the arm to enter deep through the deltopectoral groove and finally joins the axillary vein in the axilla.

The deep veins of the upper limb consists of the radial and ulnar veins, which travel along either side of the respective arteries and they join above the elbow to form the

brachial vein. The superficial and deep veins communicate with each other through the perforator veins.

Indications

Peripheral venous cannulation is indicated mainly for the administration of intravenous drugs, crystalloids, colloids, blood and blood products. It can also be used for the purpose of giving contrast media and dyes during radiological investigations.

Contraindications

Localised infection in the area of insertion site is an absolute contraindication to cannulation. One should also be watchful while inserting peripheral cannulas in patients with coagulation abnormalities. Edematous limbs should be avoided as far as possible. Also avoid the limbs on the side of those who have undergone radical lymph node dissection along with mastectomy and limbs with arterio-venous fistulas as seen in patients with chronic kidney disease.

Complications

Complications associated with peripheral venous cannulation are more common in the geriatric age group and in patients on long-term steroid therapy.

Immediate	Vasovagal response Hematoma Haemorrhage
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Delayed	Infection Thrombophlebitis Extravasation
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Performing the procedure

Decision-making

One should identify the clinical need for cannula insertion to avoid inappropriate insertion and exposure to associated risks. When potential site is identified position patient comfortably with appropriate non-dominant limb below the level of the heart. The dorsum of the hand is the preferred site for the insertion of the peripheral venous cannula.

Consent

In a conscious patient, the procedure should be explained and verbal consent should be obtained. In a combative or unconscious patient, as this is not possible, peripheral venous cannulation may have to be carried out as an emergency procedure to administer fluids and drugs. Hence consent may not be mandatory under these circumstances as it is being

done in the best interest of the individual.

Equipment set up

The key equipment required are a tourniquet, an appropriate sized cannula, cannula dressing, 10 ml ampoule of 0.9% sodium chloride to flush the cannula, 10 ml syringe. In addition if blood sampling is indicated, appropriate blood collection bottles are required.



Figure 1: The cannula's are available in various sizes and are colour coded.

22G and 24G cannulae are commonly used in the paediatric age group while cannulae ranging from size 14G up to 20G are used in adults. The rate at which the fluid flows through each cannula depends on its flow rate. The following table gives an idea of the cannula size, colour code & the flow rate for each (*Table 1*).

Cannula size	Colour code	Flow rate (ml/min)
24G	Yellow	13
22G	Blue	42
20G	Pink	67
18G	Green	103
16G	Grey	236
14G	Orange	270

Table 1: Cannula size, colour code and flow rate

Thus 1000ml of fluid can be given through a 20G cannula in fifteen minutes while the same amount of fluid can be given through a 14G cannula in less than four minutes.



Figure 2: Illustrates various equipment required for peripheral venous cannulation

Technique of peripheral venous cannulation:

The following technique describes the insertion of peripheral venous cannula for the purpose of administering fluids and drugs where a hollow cannula over the needle (venflon) is used.

1. Select the arm and site for insertion of cannula
2. *Follow universal precautions throughout the procedure*
3. Apply the cannula proximal to the site
4. Ensure the vein is prominent (active movement of the arm/ wrist/ fingers/ may facilitate venous pumping and filling of the veins)
5. Position the arm at appropriate level to operators eye
6. Palpate the vein to confirm the site of cannulation and size of the cannula that matches the size of vein.
7. Clean the skin overlying the insertion site with Chlorhexidine solution and allow it to dry
8. Select the exact point of needle entry, and administer local anaesthetic to skin
9. Insert the cannula over needle assembly (venflon) over the point of entry over the skin, so that the bevelled end is facing upwards (towards the operator) and sharp end piercing the skin.
10. Pierce the skin at an angle of 30° to 45° to skin
11. Advance the cannula needle assembly whilst observing flashback of blood on to the hub
12. Once the flashback of blood is observed whole assembly should be flattened (just about 10 to 15 angle to the skin advanced for further 0.5cm
13. Now keep the needle steady and gently advance the cannula into the vein

14. Now release the tourniquet and withdraw the needle whilst manually occluding the proximal end of cannula.
15. Insert the protective cap at the distal end and release the proximal occlusion
16. Apply a dressing over the insertion site and insert the date label over the dressing.

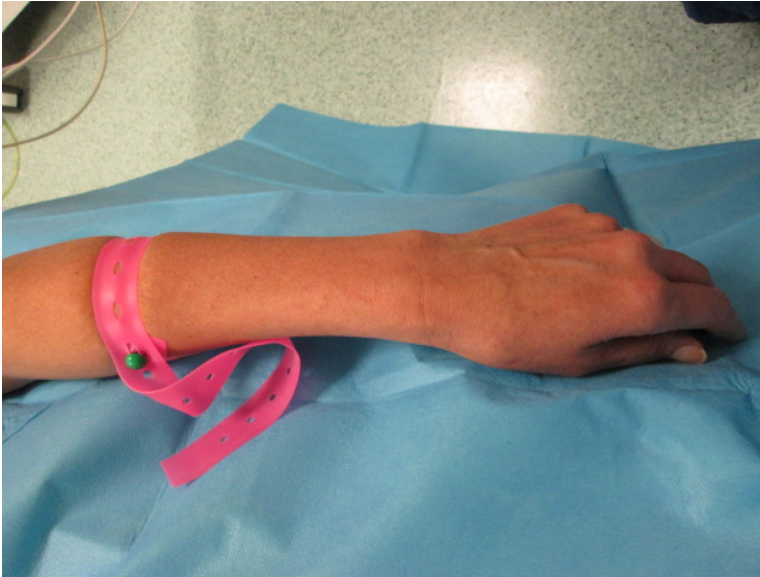


Figure 3: Tourniquet applied on the chosen limb



Figure 4: Palpate the vein followed by skin preparation. Please allow time for the antiseptic to dry.



Figure 5: Administration of local anaesthetic. A skin wheal raised at the site of cannula insertion using 1% lignocaine (<0.5 ml of local anaesthetic)

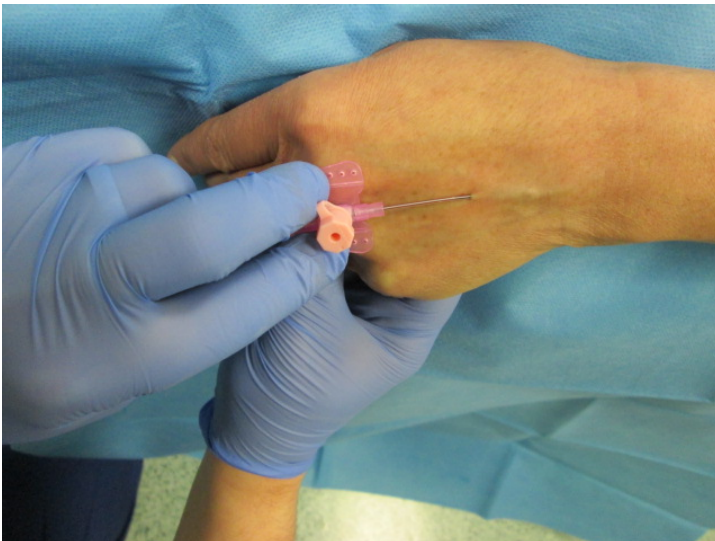


Figure 6: Cannula should be inserted at an angle of 30° to 45° to skin and advanced for 1-1.5 cm. Watch for the flashback of blood onto the hub. Once the flash back is observed, whole assembly should be flattened (just about 10 to 15 angle to the skin advanced for

further 0.5cm.

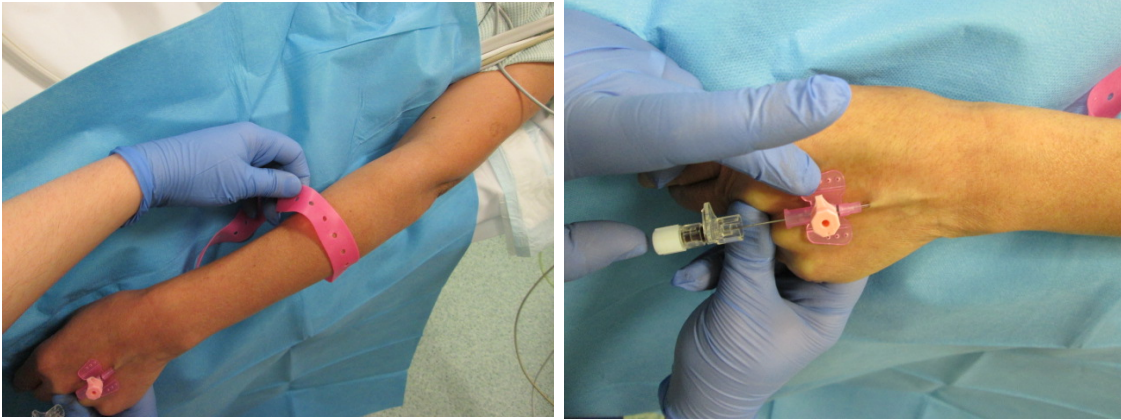


Figure 7. Tourniquet to be released and the needle is with drawn

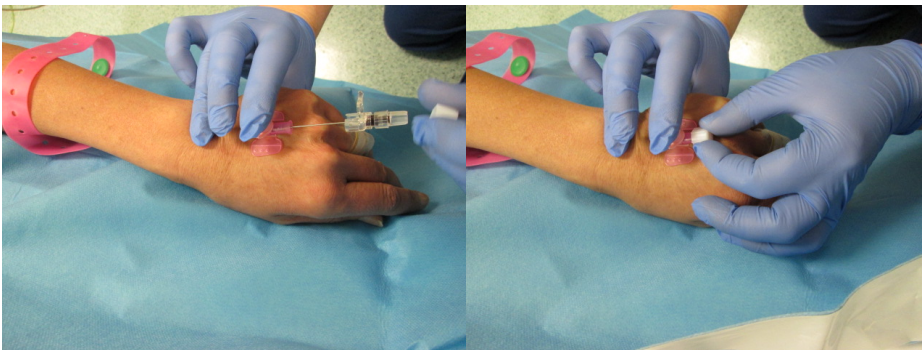


Figure 8. Needle is removed and occlusive cap inserted at the end of cannula hub.

Post procedure care

The cannula should be flushed with 2 ml of saline to ensure its patency before use.

The procedure should be documented in clinical records.

Phlebitis score should be maintained with the cannula in-situ.

The venous cannula should be removed / replaced no later than three days after insertion.

Further reading

1. Rickard CM, Webster J, Wallis MC, Marsh N, McGrail MR, French V, et al. Routine versus clinically indicated replacement of peripheral intravenous catheters: a randomized controlled equivalence trial. *Lancet*. Sep 22 2012; 380(9847): 1066-74.
2. Ortega R, Sekhar P, Song M, Hansen CJ, Peterson L. Videos in clinical medicine. Peripheral intravenous cannulation. *N Engl J Med*. Nov 20 2008; 359(21): e26.
3. Aziz AM. Improving peripheral IV cannula care: implementing high-impact interventions. *Br J Nurs*. Nov 12-25 2009; 18(20): 1242-6.