

INTRAVENOUS CANNULATION - A CORRECT APPROACH

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INTRODUCTION

Intravenous cannulation is a routine procedure to many clinicians and nursing staff, in fact it is the most commonly performed invasive procedure in daily hospital practice. IV cannula can be used for administration of drugs and solutions intravenously and these can occasionally result in complications such as thrombophlebitis and the formation of haematoma. If appropriate standards of hygiene and correct insertion procedures are used, these risks can be minimized however.

AREAS OF USE OF PERIPHERAL INTRAVENOUS CANNULA

INDICATIONS:

- To maintain hydration and/or to correct dehydration in patients unable to tolerate sufficient volumes of oral fluids.
- Administration of drugs specifically recommended to be given intravenously.
- Administration of drugs when rapid onset of action is desired.
- Transfusion of blood
- Total parenteral nutrition
- During CPR

CONTRA INDICATIONS:

- Large blood transfusions
- Use in high flow rates exceeding 200ml/min
- In administration of particular irritant drugs or fluids

SELECTION OF IV CANNULA

The choice of the correct IV cannula should be based on the following characteristics, which are so essential for a well designed cannula:

- Easy insertion
- Minimum patient trauma and discomfort
- Allow maximum flow rates
- Provide a consistent, reliable and high level of performance

Also when choosing a type of cannula, the following criteria must be considered

- What is the purpose for which you are cannulating
- What type of infusate you are going to administer
- The patient's condition and the size of the patient's veins.

This is very important since the size of cannula in ratio to the patient's vein size can be critical with respect to the development of thrombi. Therefore it is always advisable to use the smallest cannula size, wherever possible, to deliver adequately the desired fluids.

A smaller size cannula will allow a higher blood flow around the cannula when in situ thus improving the haemodilution of fluids/drugs being administered, which is important especially in cases where more potent or irritant fluids or drugs are being administered. A smaller size cannula will also minimize the degree of mechanical irritation and the trauma on insertion.

SELECTION OF INSERTION SITE

When selecting the insertion site, it is important to consider both the size of the cannula and the condition and size of the vein into which you are going to insert the I. V. cannula

SELECTION OF SITE:

Following guide lines should be kept in mind when ever inserting a cannula;

- Distal veins should always be used first, and thereafter subsequent insertions should be proximal to those used previously.
- Allow adequate time for inspection of the vein

before selection. This will save you from a possibly big trouble later on.

- Ensure maximum venous dilation.
- Use veins in the non-dominant side of the patient, e.g. left arm for right-handed persons, and vice versa.
- If patient is undergoing surgical procedure on a limb, use opposite side for cannulation.
- Take into account the expected position of the operating surgeon and the assistants, as far as possible.
- If in any doubt, never hesitate to consult a more experienced personnel.

WHAT TO AVOID:

- Areas of joint flexion; the cannula may be blocked or kinked permanently.
- Veins in lower extremities; the flow rate can not match the desired rate.
- Veins close to the arteries and deeper lying vessels; the risk of intra arterial injection must always be born in mind. Thiopentone injected intra arterially may lead to necrosis of the distal part, and necessitate amputation.
- Median cubital veins, which should be reserved for blood sampling.
- Any veins which may already be damaged or irritated from previous use.

PRE - INSERTION PREPARATION

This can be categorized into four main areas, the products required, the patient, the clinician or nursing staff, and the vein itself.

THE PRODUCTS:

- Make sure all products required for the cannulation procedure are easily accessible
- Check all injections and infusion solutions to be used
- Assemble all the products and flush the IV tubes to remove any air bubbles
- Label each bottle and bag as required by each hospital policy (if any)

THE PATIENT:

- Make the patient comfortable and explain everything in simple terms regarding the procedure
- Check patient identification
- To relieve his anxiety, ask the patient to inhale deeply during the insertion procedure. This simple procedure has been found of immense value in this regard.

THE CLINICIAN:

- Wash hands thoroughly with antiseptic solution to prevent nosocomial infections or any cross contamination
- Always wear protective gloves especially with high risk patients
- Ensure you have correct lighting around
- Position your seating to be comfortable for insertion, particularly the height is important.

THE VEIN:

- Create an adequate venous filling by applying a tight tourniquet. Apply enough pressure to obstruct venous flow but not arterial flow.
- To encourage further venous filling adopt one or more of the following manoeuvres:
 - a) Instruct the patient to clench or pump the fist
 - b) Tap the vein lightly, but not with force, as the aim is not to produce erythema.
 - c) Allow the arm to hang over the bedside to let the blood pool with gravity.
 - d) Immerse the arm into warm water for approximately 20 minutes. This is especially useful in small children and infants.
- Ensure the tourniquet can be removed quickly and easily as soon as the vein wall is punctured.

CANNULA INSERTION TECHNIQUE

The following technique is related to the insertion of winged cannula with drug port, and it may be different for other types.

1. PREPARE THE PUNCTURE SITE:

Clean the site and the immediate area around the site with iodine or an alcohol skin prep. Allow this to dry for 1-3 min. Do not repalpate the area after this.



2. INSPECT AND GRIP THE IV CANNULA:

Ensure that the cannula packaging is intact and the product has not expired. Wear



protective gloves and *fold down* the wings. Hold the cannula firmly with a *three-point grip*. This will minimize the risk of touch contaminating the Luer lock connection. The three-point grip ensures a correct positioning between the needle point and the catheter tip.

3. INSERT THE IV CANNULA:



Insert the cannula into the vein at a low angle. Entry of the needle tip into the vein is indicated by the presence of blood in the flashback chamber of the cannula. At this point lower the cannula further down. The flow control plug at the rear of the cannula stops the flow of the blood.

4. ADVANCE THE CANNULA:

Advance the cannula a few millimeters further into the vein, which ensures that the catheter tip is also entering the vein. Avoid touch contamination by holding the hub by the wings or protection cap. Withdraw the needle partially and firmly hold the flash back chamber thus immobilizing the needle. Advance the cannula off the needle into the vein in a gentle gliding motion and remove the tourniquet. The needle must never be reinserted while the cannula is in the vein since there is a risk of severing the cannula.



5. WITHDRAW THE NEEDLE:

To avoid blood spillage, press a finger or two on the vein on or above the *cannula tip*. Withdraw the needle completely and connect the infusion line or close the cannula with the Luer lock plug.

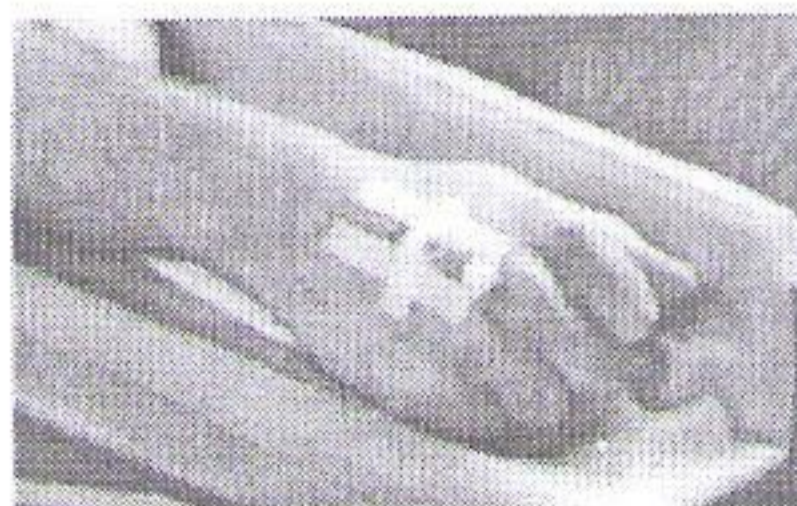


6. REMOVE THE LUER LOCK PLUG:

The plug is removed by holding it between the thumb and the middle finger while pushing the needle forward with the index finger. Dispose of the needle into a suitable container. Never attempt to resheath the needle.

7. FIXATION OF THE CANNULA:

Tape the wings securely to the patients skin and this should be such that it does not affect



the blood flow around the cannula as this may encourage thrombus formation and reduce dilution of irritant fluids. Neither it should compress the vein proximally, thus occluding the blood flow. Good fixation will prevent from accidental dislodging or folding up, as well as reduce mechanical irritation thus leading to thrombophlebitis.

8. DRESS THE ENTRY SITE:

Using either sterile gauze or a sterile non-occlusive dressing, cover the entry site on the skin to prevent infection at the site of entry into the vein. Remember the portal of entry is usually along the intravenous catheters in catheter related septicemia or bacteraemia.



9. USE OF THE INJECTION PORT:

The injection port on the cannula is designed to administer injections without the use of needles and or flushing the cannula. When the injection port is not in use, the port must be kept closed with the cap. During the induction of anaesthesia the syringe can be left in the port to enable repeat injections at short intervals of anaesthetic drugs, e.g. propofol or short acting muscle relaxants, e.g. succinyl choline.



CARE & MAINTENANCE OF THE IV CANNULA

Taking care of the IV cannula and the insertion site is of utmost importance in the prevention of infection. The following measures should be taken into consideration in the management of all IV cannulae:

- Site inspection: The site should be checked regularly for signs of infection
- Change of Dressing: Wet or dirty dressing must be changed
- Vein reaction: If redness, tenderness or swelling associated with the cannula show, then the cannula must be removed.
- Careful Handling: Care must be taken when handling the cannula or any other associated products to minimize risk of contamination.
- Cannula Change: Time of insertion should be recorded and cannula should be resited every 48-72

hours. IV administration sets should be changed every 24 to 48 hours.

- **Secure Fixation** The cannula should be secured properly and covered with a non occlusive dressing to prevent moisture build up at the insertion site
- **Connections Check.** Always check all the connections for tightness. A loose giving set may pull out. Deaths have occurred from bleeding in this way.
- **Patency of the Line:** Heparinised saline or physiological saline must be used regularly to flush the cannula to maintain patency.

PREVENTION OF COMPLICATIONS

Like all other invasive procedures, IV cannulation is not without potential complications. Complete aseptic technique is the only way to avoid bacteraemia, septicaemia or thrombophlebitis. Meticulous technique and strict attention towards detail will prevent most of the complications.

COMPLICATIONS WHICH CAN OCCUR COMMONLY:

- **Haematoma:** This is a collection of blood and can be formed through leakage of blood from the vein into the tissues around the insertion site. It can occur when on insertion of the cannula, the vein is not punctured properly, or can occur when removing the cannula. To avoid this, ensure that adequate venous filling takes place and plan venipuncture carefully. Haematoma caused by removal of the cannula can be avoided by applying pressure on the puncture site for 3-4 minutes after removal of the cannula. Rubbing the puncture site will serve no purpose. Elevation of the limb may often be useful.

- **Infiltration:** This occurs when the infusate enters the subcutaneous tissue rather than the vein. Leakage of some infusates e.g. hypertonic, alkaline or cytotoxic solutions can also result in tissue necrosis. Early identification is important and resiting of the cannula is the solution. Flexible cannula with good fixation is the way to avoid infiltration.

- **Thromboembolism:** It can be minimized by using a small gauge size cannula to allow good circulation around the cannula. The veins in the lower extremities should be avoided since the risk is greater here for thrombus formation. Flushing the cannula can sometimes dislodge the clot and introduce into the circulation and should not be attempted. Resiting of the cannula is recommended for clots on the cannula tip.

- **Air Embolism:** Air embolism is a possible hazard

during all forms of IV therapy including cannulation. However the risk is limited in peripheral IV cannulation due to the positive venous pressure (3-5 cm H₂O). Negative pressures can occur in peripheral veins if the infusion site is elevated above the heart level.

- **Phlebitis & Septicaemia:** Phlebitis is an inflammation of the vein. It can be due to chemical or mechanical irritation or infection. As a result, a thrombus can form resulting in thrombophlebitis. The most important factors affecting this are the duration of the cannula remaining in situ and the type of fluids administered. Other factors of lesser degree are the size of the cannula and the site of insertion chosen. The first signs are redness and pain followed by swelling at the insertion site; and in severe cases erythema extends more than 5cm proximal to the tip. Pus can be seen at the insertion site on removal of the cannula. Such a condition can develop into a serious suppurative phlebitis and or septicaemia and this is the most serious complication of IV therapy, and is associated with significant mortality rate. Samples for blood culture should be taken and expert advice sought.

To minimize risk of phlebitis:

- a) Use aseptic techniques
- b) Choose smallest cannula gauge possible to achieve the prescribed treatment
- c) Secure fixation to prevent cannula movement
- d) Dilute irritant drugs adequately and infuse at prescribed flow rates
- e) Change the insertion site every 48-72 hours

WHAT TO DO IF INFUSION STOPS?

The infusions will stop after a few hours, and to keep them running is an art.

- a) Inspect site for infiltration or thrombophlebitis
- b) Check fluid level in the bag or bottle
- c) Check for kinks in the tubing
- d) Open all flow rate regulating clamps
- e) Check all air vents especially in case of burrets.
- f) Check the height of the drip chamber on the IV infusion set
- g) Check if the patient's blood circulation is restricted by anything such as tape or dressing
- h) Check the cannula position since the tip could be against the wall of the vein and a slight movement of the cannula may remedy this.
- i) Check stopcocks and their flow direction
- j) Check temperature of the solutions, since very

cold solutions may cause venous spasms and heat may have to be applied to the vein to relieve the spasm and increase the flow.

REMOVING THE IV CANNULA

- a) Wash your hands thoroughly
- b) Remove the tape or dressings completely but DO NOT use scissors or any other sharp instrument since there is a risk of cutting the cannula and embolising cannula fragments
- c) Hold a piece of dry sterile cotton gauze over the insertion site and remove the cannula
- d) Apply firm pressure immediately for about 2- 3 min or longer to ensure that there is no subcutaneous leakage of blood. Elevate the arm if bleeding persists.
- e) If necessary apply a suitable dressing to the site
- f) Inspect the cannula removed and ensure that cannula is complete and undamaged.

HOW TO RE-SITE THE IV CANNULA

To avoid venous reactions, the insertion site must be rotated every 48-72 hours and remember that distal veins of the upper extremities must be used first with subsequent venipunctures proximal to the previous sites used. Special indications for re-siting an IV cannula are:

- a) Whenever connectors or other components on the direct IV line are touched and contaminated during manipulation.
- b) Due to a fibrin sheath possibly forming on the cannula after a blood transfusion which can lead to risk of infection, it is advised to re-site following blood transfusions and continued requirement for intravenous access.
- c) On signs of infiltration, phlebitis or infection the cannula should be removed immediately. In certain cases such as the patient being febrile without any cause, the cannula tip should be sent for microbiological lab for culture and appropriate antibiotics must be given to the patient.

HOW TO AVOID NEEDLESTICK & BLOOD BORNE INFECTIONS

Every patient must be considered a potentially infectious remembering that blood can carry certain micro organisms such as hepatitis-B and HIV and these can be transmitted directly from the patient's blood.

During IV cannulation the following must be adhered to minimize the risks:

- a) Wash hands after the procedure
- b) Cover any cuts or grazes on your hands with impermeable tape prior to cannulating
- c) Wear surgical gloves
- d) Avoid injections through use of needles wherever possible
- e) Do not resheath the needles
- f) Dispose of needles into safe containers

In the event of accidental inoculation the following actions can be taken:

- In the event of needlestick injury, the affected part must be washed thoroughly with running water and encouraged to bleed. Use povidone-iodine to apply to the wound
- In the event of blood splashes on the eyes, mucous membranes or skin, the affected part should be thoroughly washed in running water.
- Soiled clothing should be dealt with appropriately
- Accident report should be completed and prophylactic measures may be subsequently required

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