اجهزة التخدير النظري /المرحله الثانيه

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Lec:2

Cannula and giving set and device for intravenous infusion

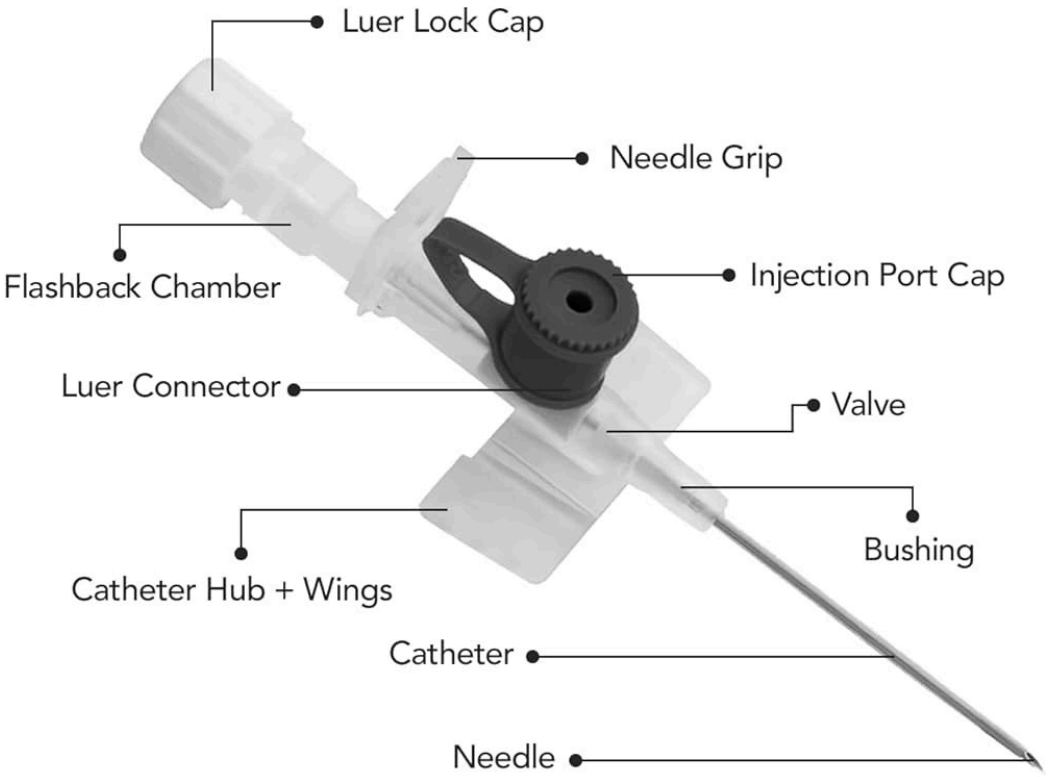
Intravenous (IV) cannulation is a common bedside medical procedure .its a technique in which a cannula is placed inside a vein to provide venous access.

indication

. IV fluid therapy
• IV drug administration
• Transfusion of blood products
• Blood sampling
.IV nutritional support.
• IV administration of contrast agents for radiological interventions.
. emergency treatment of a tension pneumothorax .

parts of cannula

ametalic stylet with a luer chamber , a polyvinyl chloride cannla, a flashback chamber and a luer lock cap as in picture below:



Size/gauge selection:

Cannulas are sized according to standard wire gauge (SW). 'the The maximum flow rate through a cannula is important because it dictates the speed at which

SIZE	COLOR	CATHETER OD (mm)	CATHETER LENGTH (mm)	FLOW RATE (ml/min)
14G	Orange	2.2	45	270
16G	Grey	1.8	45	200
17G	White	1.5	45	125
18G	Green	1.3	45	90
20G	Pink	1.1	32	55
22G	Blue	0.9	25	36
24G	Yellow	0.7	19	18
26G	Violet	0.6	19	13

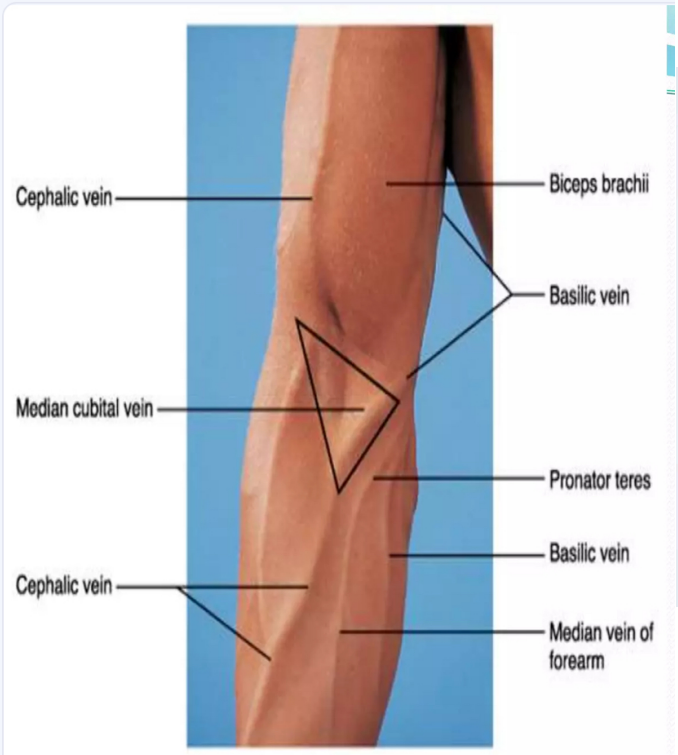
fluid can be given.

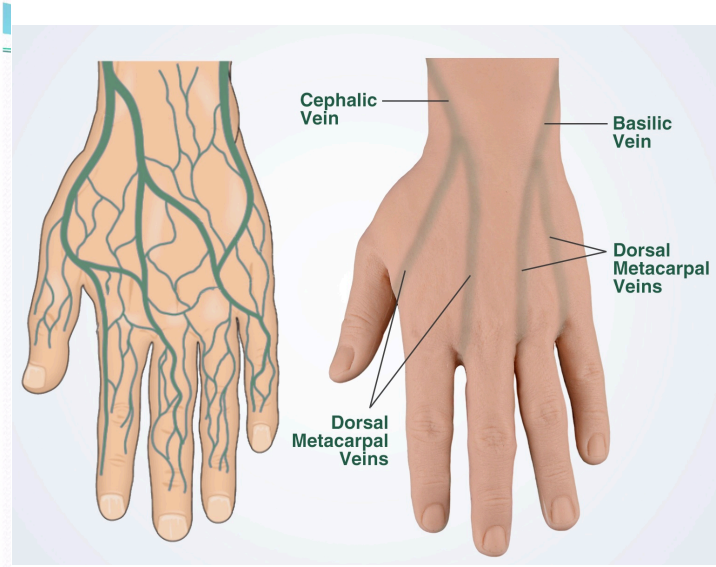
It is recommended that specific characteristics of the patient and anticipated therapy are considered in the

selection of peripheral intravenous catheter gauge and length. These include:
o age
o condition of veins
o degree of cardiovascular stability
o medical or surgical interventions

should assess specific patient factor such as pre-existing catheter , anatomic deformity, site restrictions (e.g. mastectomy, arteriovenous [AV] fistula or graft), the relative risk of mechanical complications and the risk of infection.

Selection of catheterisation site:
The distal areas of the upper extremities are optimal for site selection.





vein should be selected on the non-dominant forearm (especialy if the catheter is to remain in position for any length of time)
Site selection should avoid areas of flexion as this may predispose to phlebitis due to excessive movement causing vessel wall trauma.This may not always be possible in an emergency situation (e.g. resuscitation) when the antecubital fossa is recommended due to the need for a larger vessel.

TECHNIQUE OF INTRAVENOUS CANNULATION:
1-Firstly Assess and prepare the patient and Explain the procedure to the patient and take informed consent.
2-Clean trolley with alcohol/detergent wipes
3- Perform routine hand hygiene.
4-Collect all equipment required and check for sterility and/or expiry date.
5-Consider using local anesthesia.
Ensure patient comfort and privacy.
Place patient in appropriate position free from jewellery.
6- Select site of venous cannulation
7-.Apply a tourniquet proximally ,Look for a straight, wide vein, with no evidence of valves.
8- Prepare insertion site and sterilization the site of cannula, Clip hair if necessary,
The tip of the needle is exposed at one end of the tube and this is inserted through the skin into a vein. With the bevel facing up, slide the cannula through

the skin and into the vein until flashback of blood is seen; this indicates that the needle tip has penetrated the vein. Advance the cannula a few millimeters further to ensure the catheter as well as needle tip enters the vein; withdraw the needle and advance the cannula inside the vein.
then slide off the needle into the lumen of the vein before the needle is removed and discarded. The cannula has a connection port that stays outside the body and can be connected to an infusion. Flush the cannula with 0.9% saline to confirm placement, watching for extravasations of fluid.
and dress and secure cannula.
9-write down date of cannulation over the dressing.
Remove gloves. Perform routine hand hygiene. Return patient to a comfortable position. Provide patient with information on care of cannula. Patients should be encouraged to report any

discomfort such as pain, burning swelling or bleeding

Hand hygiene:

It is recommended that healthcare workers perform hand hygiene with an antiseptic-containing soap solution or use an alcohol-based waterless cleanser. The use of gloves does not obviate the need for hand hygiene.

Sterilization of skin :

Apply skin preparation solution and allow to air dry. solution containing 2% chlorhexidine gluconate (CHG) in ≥ 70% (ethyl or isopropyl') alcohol (alcoholic chlorhexidine)

A solution containing povidone-iodine 10% in 70% ethyl alcohol (ethanol) (povidone-iodine should remain on the skin for at least two minutes and until dry before inserting the catheter)

If alcohol is contraindicated (e.g. allergy, sensitivity, skin condition) clinicians should use aqueous povidone-iodine(26) 10%* or sterile normal saline 0.9% (the drying time for aqueous based antiseptics is longer than alcohol based products).

**Palpation of the insertion site should not be performed after the application of antiseptic, unless aseptic technique is maintained.

Local anaesthesia:

Topical local anaesthetic e.g. "eutectic mixture of local anaesthetics' (EMLA) - lignocaine with prilocaine, can be applied by clinicians 60 minutes

prior to catheterisation to reduce discomfort during insertion, particularly in children.

**Creams can leave a lipid residue that may create a focus for microbial growth; therefore residue of topical anaesthesia should be removed with a soap and water scrub, prior to skin preparation (disinfection).

COMMON PRObLEMS ENCOUNTERED IN INTRAVENOUS CANNULATION:

1- Difficulty in finding vein: common problem especially in patients after multiple cannulation during prolonged hospitalization .to solutions of this problem seek any of the following alternative sites:Ventral forearm,feet,Long saphenous vein, Neck, Intraosseous.

2-Highly mobile vein:

Seen in elderly population due to degradation of subcutaneous connective tissue; skin has be fixed tightly in these patients, to immobilize the vein, during cannulation.

3-Venous valve prevents cannula advancement: Valve in the lumen of vein may stop the cannula; cannula can be advanced by flushing the saline through cannula and simultaneously advancing the cannula.

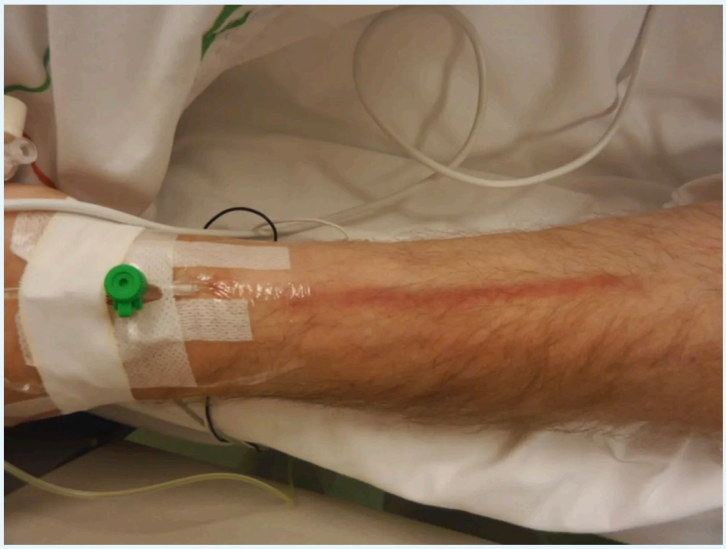
Disadvantages and complications:

1- provide a route for infectious agents to reach the bloodstream or subcutaneous tissues.

2- Cannulae are often removed or replaced after 72 hours if possible. Have a short functional lifespan,

3- tendency to migrate into subcutaneous tissues or become occluded if they are not well cared for.
4- Phlebitis :this is inflammation of the vein wall.

PHLEBITIS



Retrieved from https://casereports.bmj.com/content/2016/bcr-2016-216448.full?sid=39b2cfd9-37f2-447d-bb40-64e8335a1d3c on 2nd April 2021

5- Infiltration/ extravasation- occurs when there is leakage from the vein, and the infusate enters the surrounding tissue. In severe cases necrosis (tissue death) can occur.
Prevention includes:
Good insertion technique
Good fixation technique, clip excess hair and secure cannula properly.
Do not cannulate over a joint.
Use the smallest size cannula for the purpose of the PVC
Check for swelling around the cannula tip.

Extravasation injury of the dorsum of right foot following 10% dextrose IV infusion.

6- Thrombosis - happens when a blood clot on the cannula wall of the vein becomes detached and enters the pulmonary circulation.

7- hematoma formation

8-Arterial puncture (rare).

Remove PVC if;

No longer required.

Patient has pain when fluids are infused or on flushing

Signs of phlebitis, infection or thrombophlebitis,

changing PVCs every 72-96 hours.

An aseptic non touch technique should be maintained while dealing with PVC.

Always check the integrity of PVC before disposal.

Apply pressure to site on removal of PVC to reduce risk of haematoma.

Document removal on the PVC label found on the daily plan of care sheet.If site appears infected,

obtain swab and send to microbiology for culture and sensitivity.

Table : Administration set replacement intervals

Administration set	Replacement interval
Not containing lipids, blood or blood products	Up to 96 hours*[2, 35]
Lipid/lipid-containing parenteral nutrition	Within 24 hours*[1, 13, 35, 45]
Chemotherapeutic agents	Remove immediately after use*
Propofol	Within 12 hours or as per manufacturer* [1, 2]
Heparin	Every 24 hours*[17, 42]
Other infusions (not including blood products)	When disconnected or new catheter*
*All administration sets should be replaced when disconnected or if the catheter is changed[1, 3, 45] or after blood has refluxed into the administration set and the blood can't be cleared by flushing. When an administration set is changed, the IV fluid bag should also be changed.[44]	

In extenuating circumstances a cannula may be left in situ after 96 hours if the all of the following criteria are fulfilled:

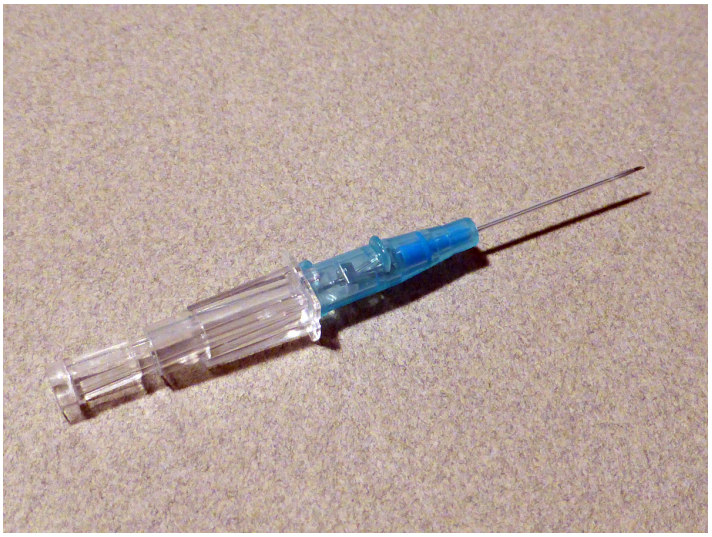
1- the patient has very poor peripheral access
2- no one else can cannulate the patient
3- the patient still requires peripheral access
4- the cannula is patent
5- there is no sign of phlebitis or infection.

2- Winged Butterfly cannula

Description: A smaller-sized cannula with flexible wings attached, resembling a butterfly shape.
Features: The wings allow for better control and stability during insertion. It is commonly used for patients with small or fragile veins, such as pediatric or elderly individuals.

3-Safety IV Cannula:

Description: A cannula designed with additional safety features to minimize accidental needlestick injuries.
Benefits: Enhances healthcare worker safety, reduces the risk of bloodborne infections, and promotes compliance with safety protocols.



3-Winged Infusion Set with Blood Sampling Port:

Description: A butterfly-style cannula with an additional port for blood sampling without the need for additional needle insertion.

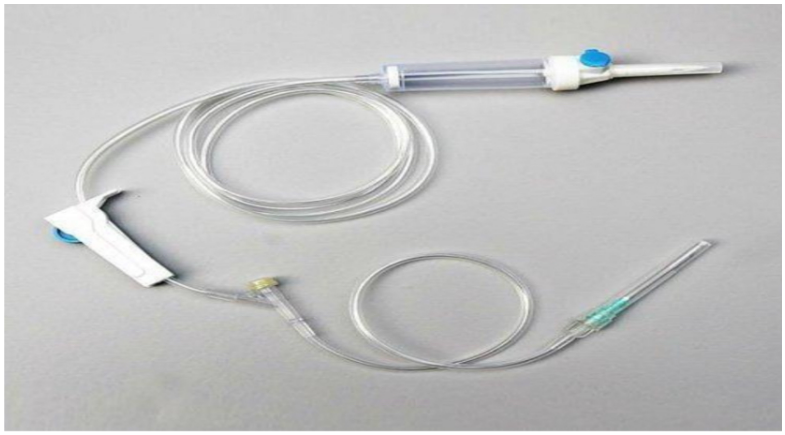
Benefits: Reduces patient discomfort by minimizing the

need for repeated needle insertions for blood sampling, particularly in patients requiring frequent blood tests.

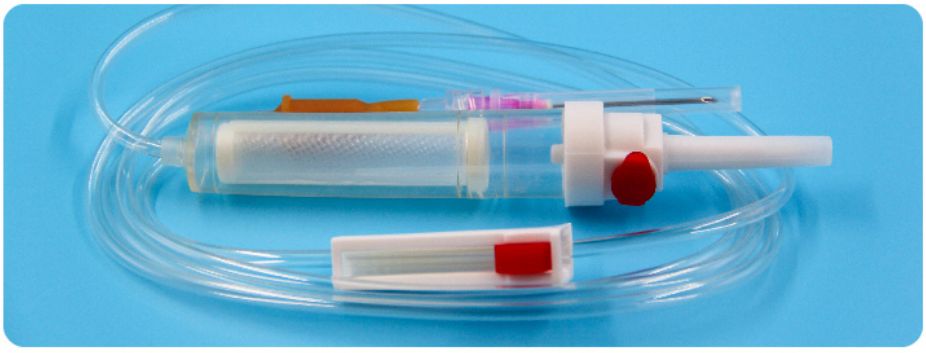
4-Arterial Cannula:

Description: A specialized cannula designed for arterial access, allowing for continuous monitoring of arterial blood pressure and blood gas analysis.

Giving set and device for intravenous infusion:
These are designed to administer intravenous fluids, blood and blood products
type:
1- A Crystalloid giving set :
A clear plastic tube of about 175 cm in length and 4 mm in internal diameter. One end is designed for insertion into the fluid bag, whereas



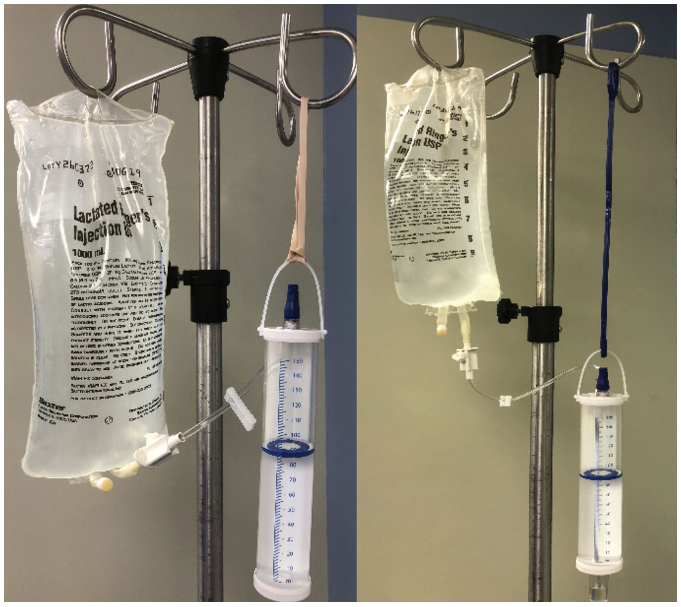
the other end is attached to an intravascular cannula with a Luer-lock connection.A flow controller determines the drip rate (10,15,20) drops of clear fluid is 1 mL
2- Blood giving sets have a filter with a mesh of about 150-200 um and a fluid chamber .



Giving sets with finer mesh filter of about 40 um are available

3-Burette giving sets (microdrips)

Micro Drip Intravenous IV Burette, 150ml with shut off Valve 60drops/ml is used to measure the volume of fluid to be infused. At the bottom, a flap/ball valve prevents



air entry when the burette is empty.

Infusion pumps

To provide accurate and controllable flow over a prescribed period or on demand.

What are they used for?

Wide range of drugs and therapies including Chemotherapy,Pain management,Total parental, nutrition,Anaesthesia/sedation Etc. etc.

types:

1-Volumetric pumps:

Volumetric pumps are commonly used to control fluid infusions via drips. The pumps run on mains or

Fig. 9.15.1: The Colleague CXE IV volumetric infusion pump. Image reproduced with permission from Baxter Healthcare Ltd.

Fig. 9.15.2: An Alaris syringe driver.

battery power and the volumes delivered are accurate to within 5–10%.

2-Syringe drivers

used for smaller volumes than volumetric pumps and also in situations where the infusion rate needs to be more accurately controlled (e.g. the infusion of vasoactive drugs in critical care). Care must be taken to avoid syphoning from syringe pumps (i.e. flow from the syringe to the patient without actively pumping – often due to gravity). Precautions include keeping the pump at or below the level of the patient and the use of anti-syphoning valves.

3-Elastomeric pumps

These pumps consist of a balloon inflated with the drug to be infused. Over time, the elastic balloon deflates and infuses the drug into the patient. No external power is required.

4-Rapid fluid infusers

Rapid infusers are designed to deliver large volumes of warmed fluid to a patient over a short period of time. The infuser incorporates a heat exchanger,The rapid infuser is usually used to infuse blood products while treating a major haemorrhage.it may also be used to deliver other fluids ,when treating hypothermia.