Intravenous Cannulation

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Objectives

- Know the commonly used **sites** for venepuncture
- Know how to **select an appropriate vein for venepuncture**
- Be able to identify challenges in venous access
- Be aware of techniques to increase **visualisation** of veins
- Be able to **set up** for IV cannulation/ drug administration
- Know how to use the **Aseptic Non-Touch Technique**
- Be aware of venepuncture **complications** and their **management**
- **Prepare and assist in the safe delivery of sedation drugs**
- Demonstrate how to assist with safe cannulation and disposal of sharps and be able to carry out venipuncture if required
- **Demonstrate safe removal and disposal of venflon**

Which sites are commonly used for venepuncture?

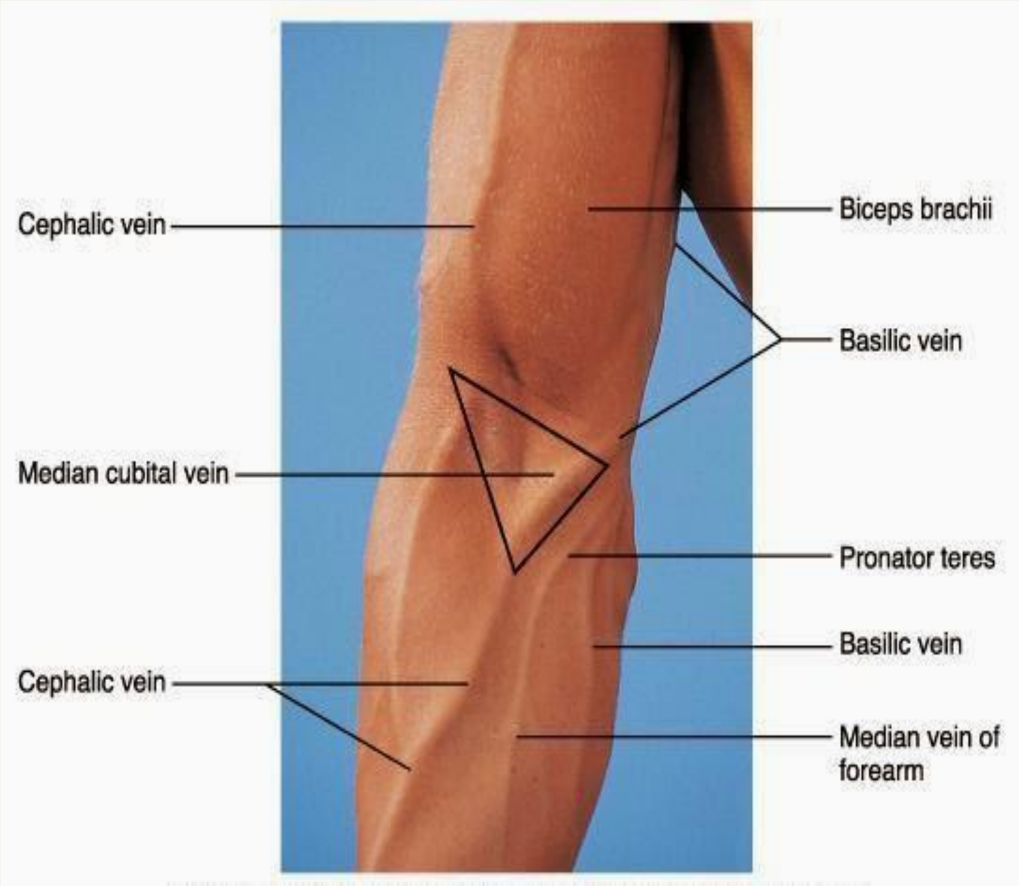
IV Cannulation Sites

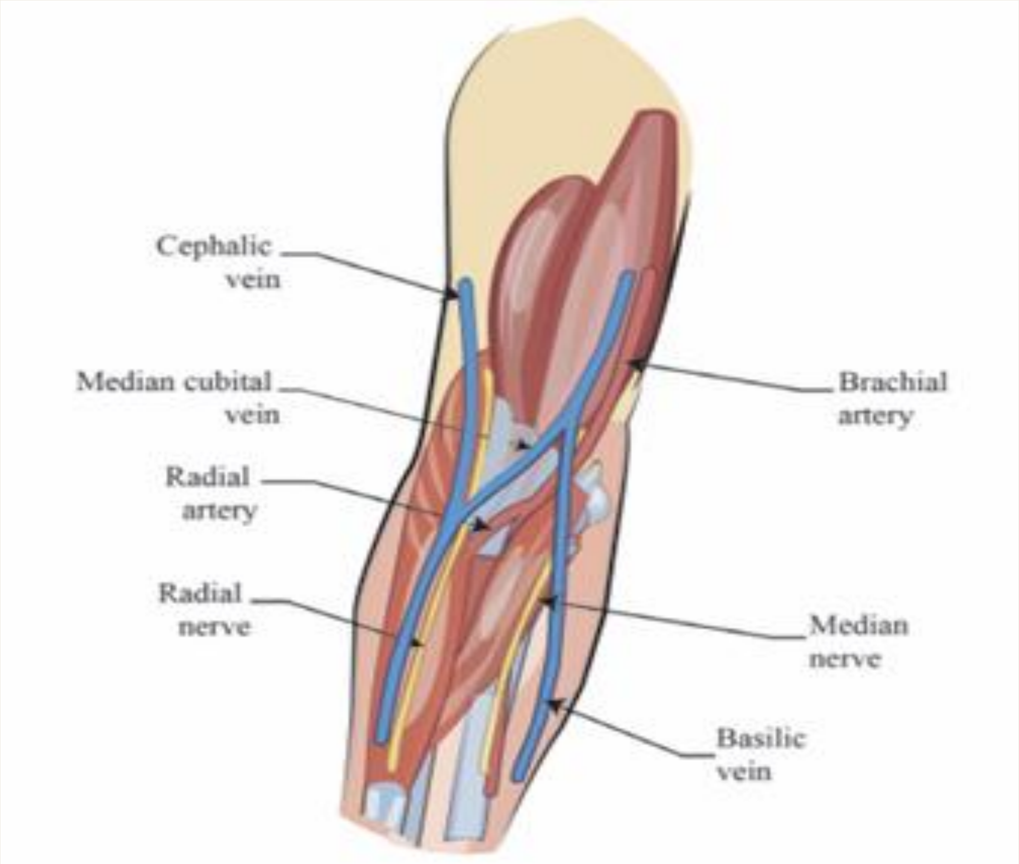
- Dorsum of hand (back of hand)
- Ventral forearm (front)
- Antecubital fossa (elbow)
- Dorsal wrist (Thumb area)

Antecubital Fossa

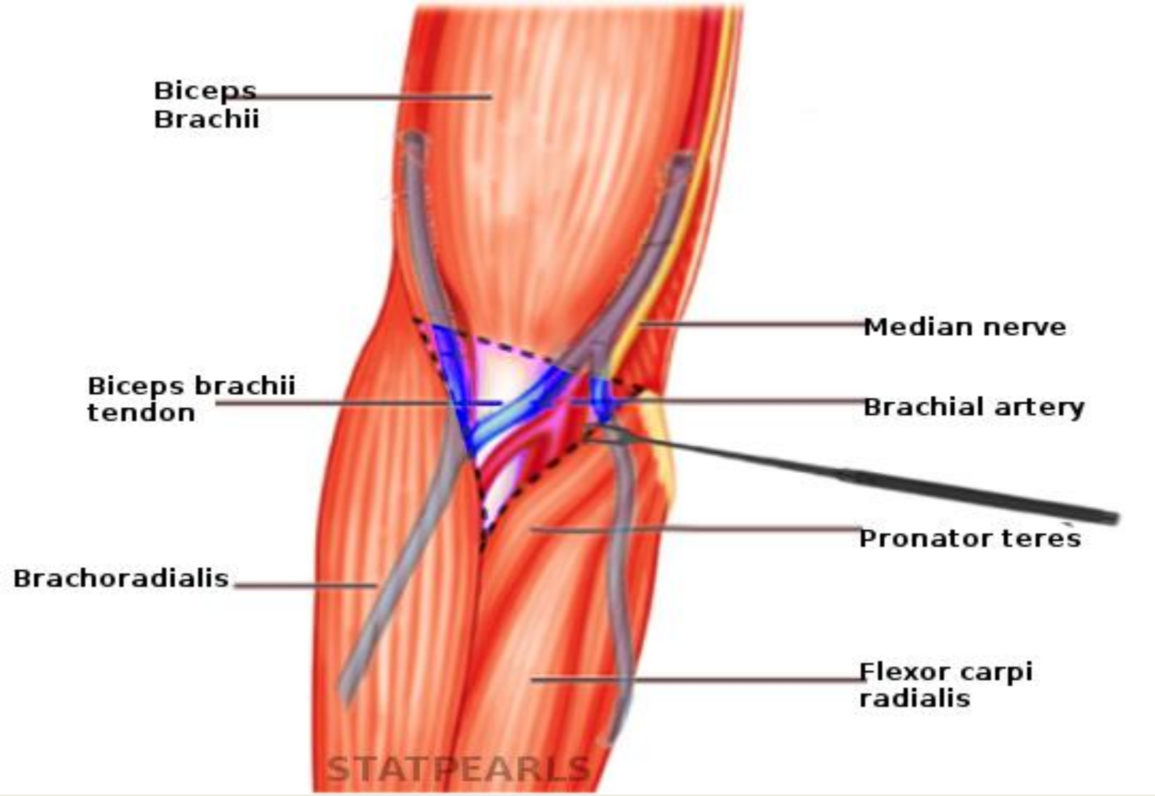
- veins are larger here and less mobile
- Lateral aspect is anatomically safe
- Veins are not as superficial here
- Medial aspect needs to be avoided

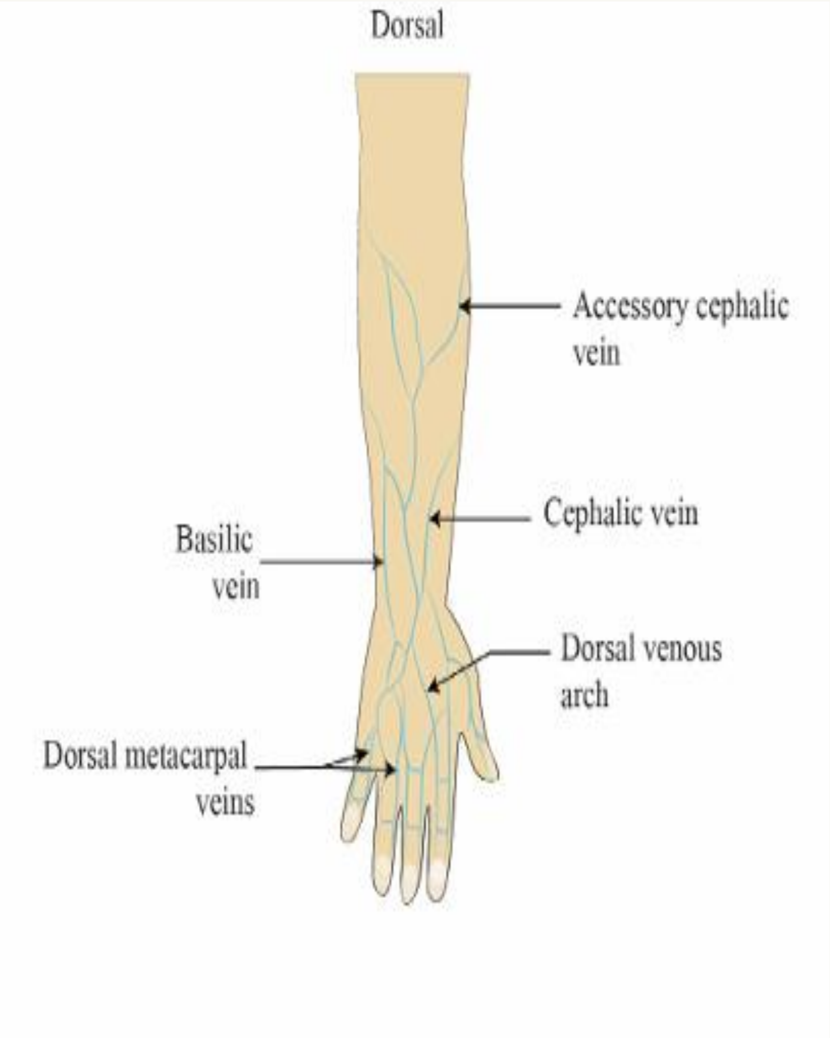
Antecubital Fossa





Antecubital Fossa

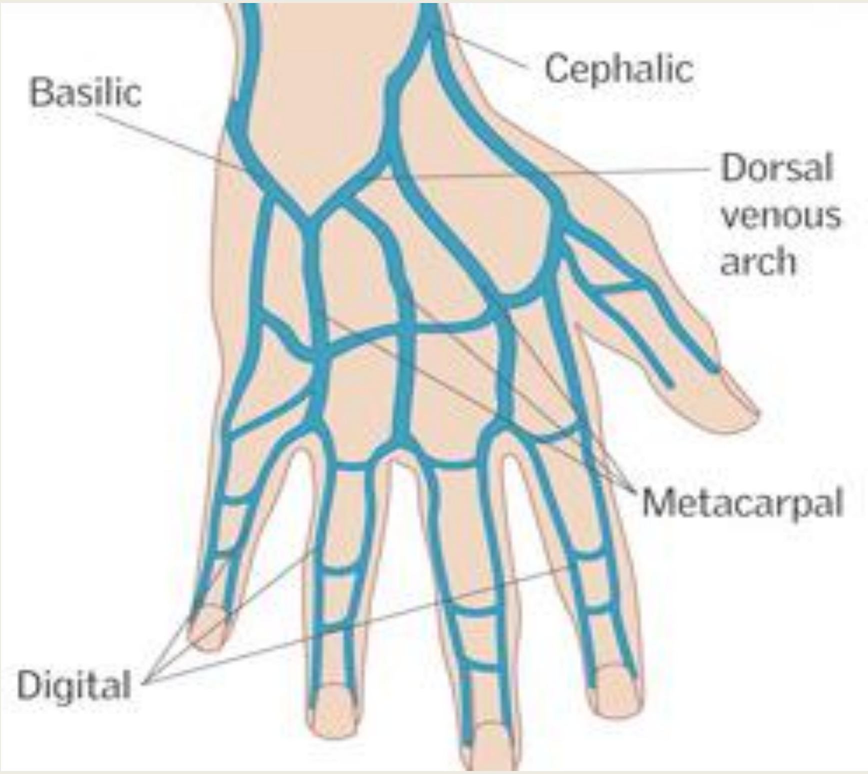




Dorsum of Hand

- **Safest** site for cannulation
- Veins here can be **small** and **mobile**
- Hold the pts hand and get them to make a **fist**
- Pull the skin of the dorsum of the hand taut over the knuckles with your thumb
- Cannulate where **2 veins meet**
- Can be more **painful** site of cannulation

Dorsum of hand



Wrist

- **Junior houseman's vein**
- Branch of the **cephalic**
- Difficult to **immobilize**
- **Avoid the ventral** aspect of the wrist - due to superficial nerve, arteries and tendons

EMLA Cream

- Eutectic mixture of local anaesthetics
- 2.5% lidocaine + 2.5% prilocaine

Consent

Patients should be made aware of the need for:

- venflon insertion
- potential insertion sites
- associated risks
- potential complications

Locating a Vein

- **Look** for veins in the aforementioned areas
- You should be able to see the **bluish hue** of the vein through the skin
- Preferably chose **straight**, and easily **visible**
- **Avoid** areas with other important **anatomic structures**
- **Avoid** limbs with prior **injury or disease**
- If you can’t see them **palpate**
- **You should not feel a pulse – if you feel a pulse this is an artery!**

What Can Make Veins Difficult to Visualise?

Difficult Cannulation

- Pt is **cold**
- Pt is **anxious**
- Pt has not had any **fluids** in a long time
- Excess **adipose** tissue
- Thin, **thready** veins
- Previous **injury, scarring** or **tattoos**
- **Mastectomy and lymph node dissection – can’t place cannula in the arm where nodes have been removed**due to the risk of lymphoedema developing post node removal

Local factors

The Adult Difficult Intravenous Access Scale (A-DIVA) is a recently created predictive scale to identify patients with difficult intravenous access. This additive A-DIVA scale predicts the likelihood of a difficult intravenous access in adult patients prospectively, based on clinical observations and five variables (Table 2).[12]

Variables	Score
An inability to detect a vein suitable for cannulation by palpating	1
An inability to detect a vein suitable for cannulation by visualising the extremity	1
A vein diameter of two millimetres or less	1
A known history of a difficult intravenous access	1
Emergency / unplanned need for surgery	1

Table 2 The additive A-DIVA scale

Systemic patient factors	Local patient factors	Clinical factors
High body mass index	Tattoos	Clinician technique
Dehydration	Pigmentation	Clinician experience
Diabetes mellitus	Sclerosed veins	Light and illumination
Hospitalisation in the last 90 days	Collapsed vein from previous access in the last two weeks	Type of tourniquet
Parenteral drug misuse	Previous history of difficult access veins	Cannula gauge and site of insertion (antecubital fossa higher risk site for infection due to prominence of Staphylococcus Aureus bacteria)
Chemotherapy via peripheral cannula	Non-palpable veins	Cannulation adjuncts available (resources available in primary and secondary care differ).
Haemodialysis	Alterations of the limbs (access sites) including surgical scar, medical device	
Chronic obstructive pulmonary disease		
Age (vein diameter increases with age)		
Gender (more difficult access in females)		
Anxiety (peripheral vasoconstriction)		

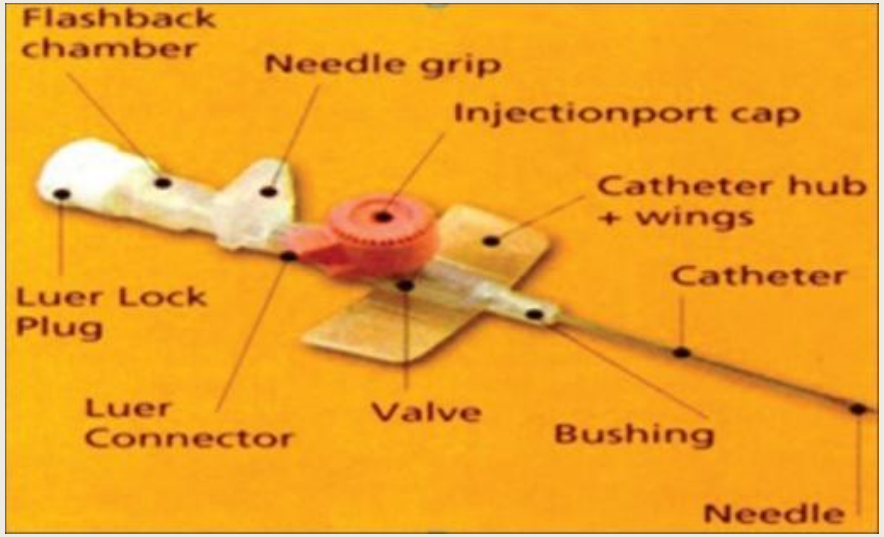
How to Increase Vein Visibility/ Access

- Pre-sed assess – examine the pts veins, find out if they ever have any difficulty with IV access – do they have a **preferred site**?
- Make sure they have **fluids** up to 2hrs before
- **Warm** the pt
- Let the **arm hang down** and encourage the pt to **pump their fist** to distend veins
- **Percuss** the veins
- **BP cuff** – inflate to a pressure between diastolic and systolic
- **N_2O**
- **Vein visualizer**
- **Ultrasound**
- 2% to 4% **nitroglycerin ointment**
- Use **narrower** gauge cannula

Equipment

- Tourniquet
- Alcohol wipe
- Safety cannula 22/24G
- Tape
- Saline or water for injection
- Midazolam
- 3x 5ml syringe and 21G needles
- Labels
- Kidney dish

The Cannula


Flashback
chamber
Needle grip
Injectionport cap
Catheter hub
+ wings
Catheter
Luer Lock
Plug
Luer
Connector
Valve
Bushing
Needle

Aseptic non touch technique

- Wash hands
- Don gloves
- Clean kidney dish with universal wipe
- Remove gloves, decontaminate hands
- Now drop – alcohol wipe, cannula (22G), tape, stickers, tourniquet, syringes (5ml) and drawing up needles(23G), vials of midazolam and saline
- Check the dates of drugs with a colleague before drawing up
- Draw up drugs


McKESSON


MIDAZOLAM
mg/mL


FINEPORE

Equipment


Midazolam
1 mg/ml
Solution for Injection / Infusion
2 mg in 2 ml
Each 2 ml ampoule contains 2 mg of midazolam
For intravenous, intramuscular and rectal use
hameln


Water for Injections
10 ml


clinell
2% CHLORHEXIDINE IN 70% ALCOHOL

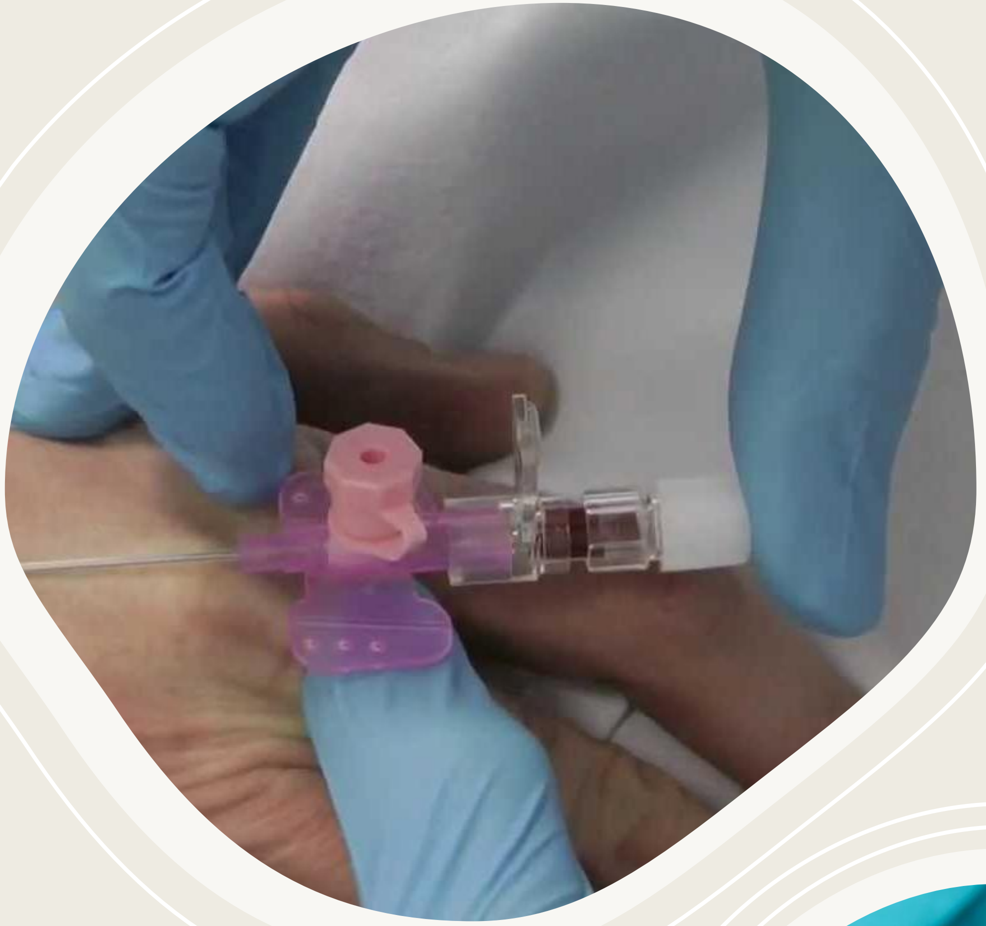
Flumazenil

Communication and behaviour management

- Important to make the patient feel relaxed, good to distract them with conversation
- Advise patient what you are doing during the procedure – “feel a small scratch”
- Encourage the patient to keep their arm still
- Ask if they are allergic to tape before applying
- Advise that they should feel something cold when administering saline/ midazolam initially
- Ask the patient to inform you/dentist if they feel pain when administering

ANTT

- Apply tourniquet / manual compression from an assistant 10 cm to 15 cm from the desired cannulation site
- Get pt to pump fist – keep fist clenched whilst doing venipuncture
- Select a vein
- Prepare the site with alcohol wipe 30secs allow to dry
- Secure the vein
- Introduce the cannula at 15-30 degrees



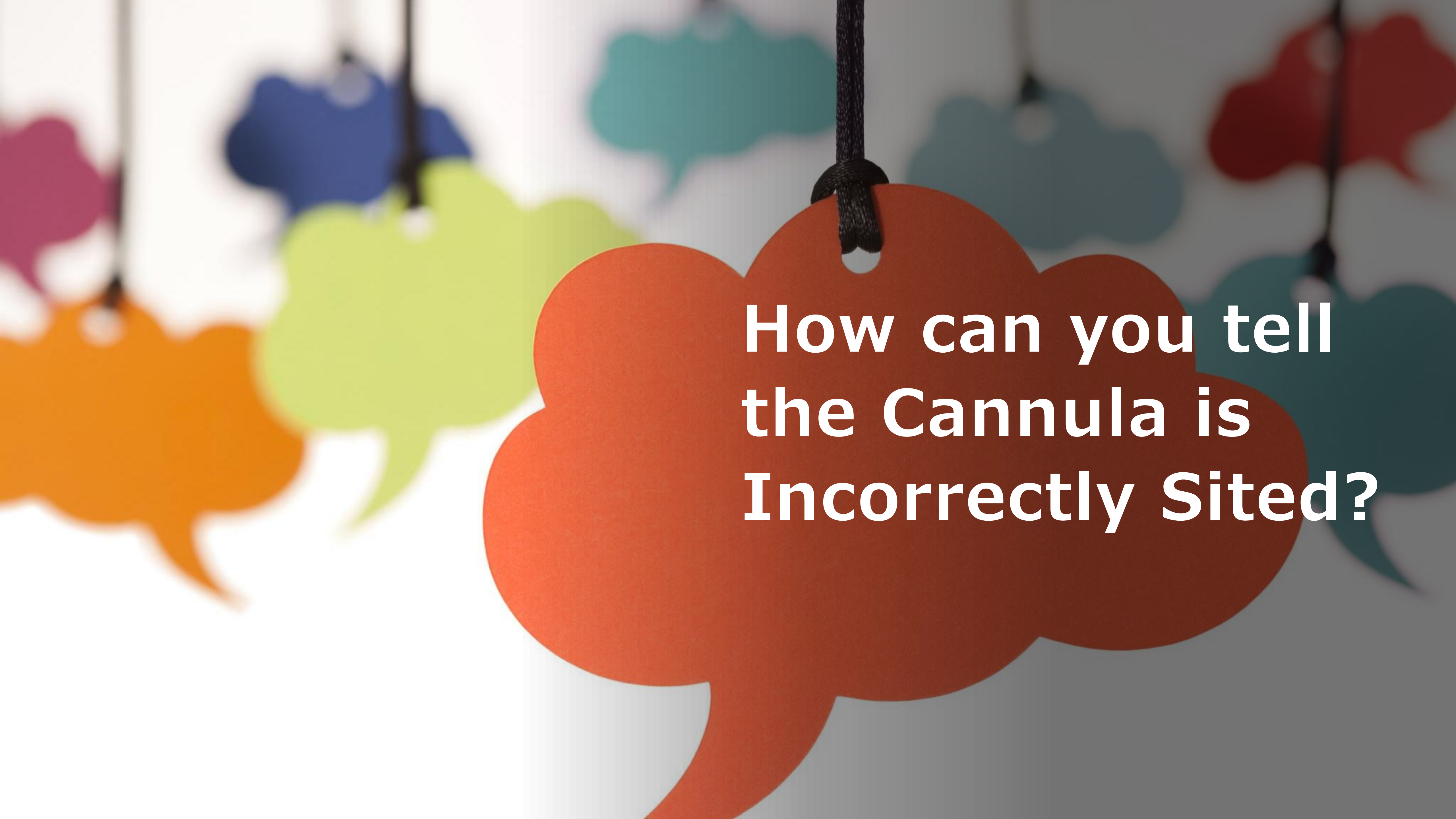
ANTT

- Once in the vein there should be primary flashback in the posterior chamber
- The angle of the cannula should be reduced and advanced further into the vein
- The needle should be withdrawn slightly and there should be secondary flashback in the anterior part of the cannula
- The cannula should be advanced to the hub – stop if you meet resistance
- Pressure should be applied to occlude the lumen
- Cap placed and venflon secured with tape

ANTT

- The tourniquet should be removed
- The needle should be removed and placed into the sharps
- The cap should be placed securely onto the posterior chamber
- The port should be opened and flush with saline
- Tape down – check the pt is not allergic first
- Dispose of all waste appropriately
- Wash hands
- Once midazolam is titrated flush with saline again

Cannulation Complications



How can you tell the Cannula is Incorrectly Sited?

Are you in the right place?

- If the patient feels **pain** when you flush - NO!
- If there is **swelling** at the site of the cannula – NO!
- **Bright red** blood if in artery
- The cannula may be **pulsating**
- **Abnormal pain**
- **Stop!!**
- **Remove and re-site cannula**

Extravenous Injection (Tissuing)

- Occurs when the cannula fails to penetrate the lumen of the vein or transects it
- The cannula is located in the subcutaneous tissues
- When you administer saline it will pool in the tissues –form a lump
- Should any midazolam be deposited subcutaneously – stop – remove the cannula – massage the area – resite
- Small amounts will disperse and cause no residual problems
- **Rarely if an excessive amount of fluid is forced into the subcutaneous tissues skin necrosis can occur**

Intra-arterial Injection

- **Rare complication**
- This can be avoided by **good venepuncture** technique
- Select veins away from vital structures
- **Dorsum of hand** is a good site as all arteries are on the ventral aspect of the hand
- If using **ACF** use **superficial veins lateral** to the biceps tendon - so as to avoid the brachial artery and the median nerve

Intra-arterial Injection

- **Palpate!!!** Veins are pulseless
- Observe the **colour** of flashback – bright red = artery
- Intraarterial cannulation is **painful**
- Injecting saline will produce **discomfort radiating down the arm**
- **Terminate administration** immediately if you are in an artery
- **Pressure** should be applied to the site and arm **elevated** to prevent haematoma formation

Intra-arterial Injection

- If midazolam is administered there is a potential for **arterial spasm**
- **Brachial artery spasm is dangerous** and is characterized by intense burning pain radiating down the arm
- The **skin blanches** and the radial and ulnar **pulses weaken/absent**
- This needs **treated quickly** as it can result in static blood coagulating, thrombosis, ischaemia and gangrene

Intra-arterial injection treatment

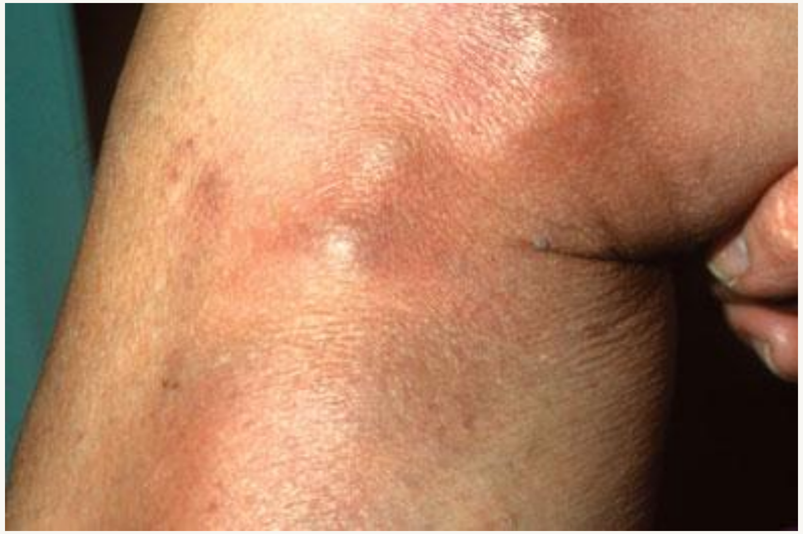
- **Leave the cannula in place**
- The patient needs **urgent medical attention**
- Administer **procaine 1%** through the cannula to promote vasodilatation
- Provide **local analgesia**
- **IV heparin or sympathetic blockade** may be required if spasm does not resolve
- **Midazolam causes minimal vessel irritation and is unlikely to cause a significant issue if injected into an artery**

Post-operative Haematoma

- Good venepuncture technique is essential to avoid post-op haematoma and thrombophlebitis
- Many pts develop haematoma at the site of cannulation
- This can be prevented by ensuring **firm pressure** is applied when cannula is removed – not with bent elbow – **3mins**

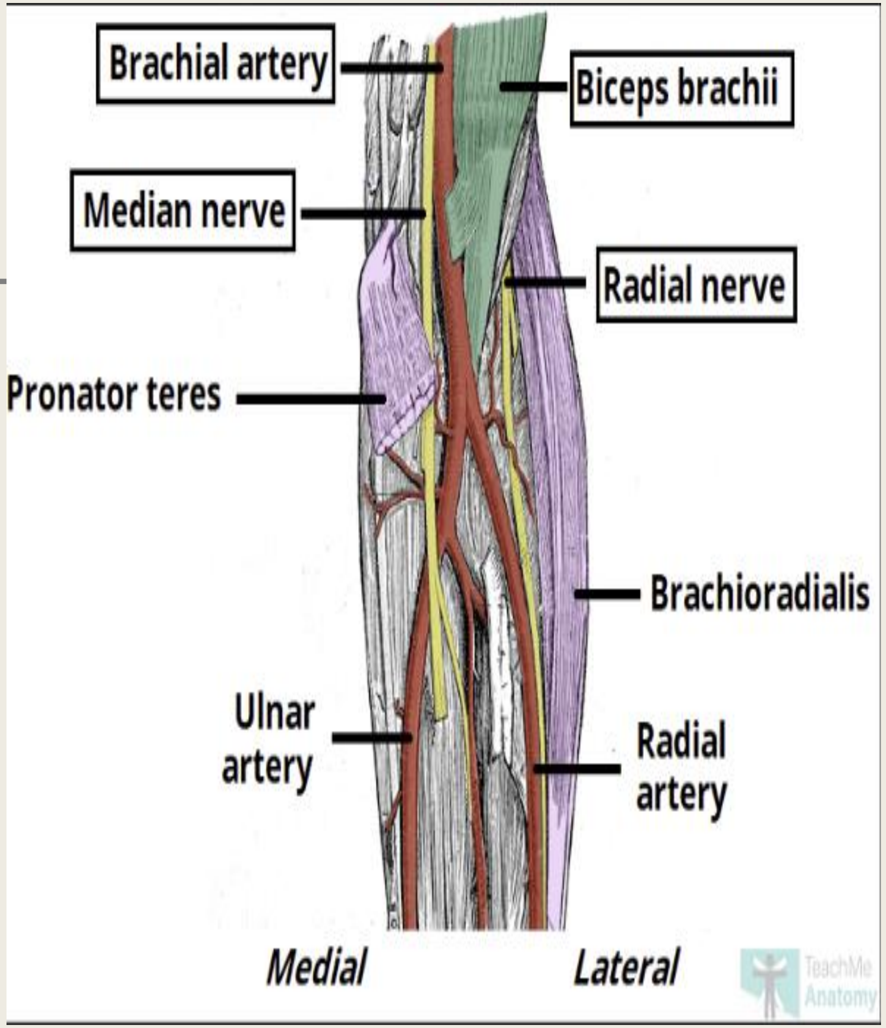
Thrombophlebitis

- **Inflamed vein, can be due to mechanical trauma**
- **Poor technique, damaged cannula, excessively rapid injection or use of an irritant sedation agent can cause thrombophlebitis**
- The signs of thrombophlebitis can occur from **days to weeks** following the sedation appt
- Pts present with **hardening** of tissue, **oedema, inflammation and pain** over the course of the vein which was used
- The infected vein may feel **hard and raised**
- **Thrombophlebitis normally improves over time**
- Pt should be reassured and kept under review until the infection has resolved
- **The larger the vein and the smaller the cannula the less likely there is to be irritation**



Nerve Damage

The median and radial nerves are at most risk during cannulation of the basilic or cephalic vein at the antecubital fossa



Record of Cannulation/Titration

- Dose, route and times of administration of drugs
- Site of cannulation and attempted cannulation
- Size of cannula used

Discharge

- The cannula should remain in situ until the patient is suitable for discharge and vital signs are checked
- This allows for flumazenil to be administered quickly should the need for reversal arise
- Remove cannula
- Apply firm pressure
- Apply dressing

Risks associated with repeated cannulation

- Pain
- Infection
- Nerve damage
- Bleeding
- Haematoma
- Air embolism
- Occlusion
- Loss of confidence
- Increased anxiety

What to do if cannulation fails

- Reappoint the patient – advise them to hydrate well before appointment and make sure they are wearing warm clothing/ have hot water bottle
- Use an alternative technique such as inhalation sedation

Disposal of cannula

- If there is a failed attempt at cannulation the cannula along with the needle should be placed in the sharps
- A new cannula should be used for each new site
- On discharge of the patient the cannula should be removed and firm pressure applied to the area with gauze to prevent haematoma formation for 3 minutes
- The cannula which is now just a plastic tube and no needle can be placed into clinical waste

References

- Gupta A, Nagpal T. Cannulation conundrums: what help is available?. SAAD Dig. 2024: 40(II): 117-123
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Questions?