Venepuncture

Year 2 Dental Students

Practical Skill Session
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Anatomy and Physiology

- Structure of veins
- Superficial veins
- Antecubital Fossa
Superficial Veins Of The Upper Limb

- Cephalic vein
- Median Cubital vein
- Basilic vein
- Accessory Cephalic vein
- Palmar Venous Plexus
- Palmar Digital veins
- Superficial Median vein of the forearm
The Forearm Veins

The Cephalic Vein

Forms from a confluence of veins at the base of the thumb and passes upward along the radial (lateral) aspect of the forearm to enter the lateral part of the antecubital fossa.

PRO's.
- Readily receives a large cannula and is therefore a good site for blood administration.
- Splinted by the forearm bones.
- Cannula is easily secured.

CON's.
- Can be more difficult to cannulate than the metacarpel veins.
- May be confused with an aberrant radial artery.

The Basilic Vein

Forms from a confluence of veins on the postero-medial aspect of the wrist and passes upward slightly posterior to the ulnar (medial) border of the forearm but winds round over the ulnar to enter the medial aspect of the antecubital fossa.

PRO's
- A large vein that is frequently overlooked in the hunt for veins.

CON's.
- Requires awkward positioning of the limb to gain access to the vein.
- The vein tends to roll away when you attempt to cannulate it.
- Sites prone to phlebitis.
- Cannula port gets caught on sheets.

The Median Veins Of The Forearm

Many Veins with vary variable courses.
Metacarpal Veins

**PRO's**
- Easy to see and palpate veins.
- Splinted by metacarpal bones.
- Allows use of more proximal veins in the same limb should the cannula need to be re-sited.
- Cannula is easily accessible in the theatre environment.

**CON's**
- Active patients may dislodge easily.
- Dressing may be compromised by handwashing.
- May be more difficult if the skin is thin and friable.
- Flow can be affected by wrist flexion or extension i.e. A POSITIONAL VENFLON.
The Veins Of The Antecubital Fossa

At least 3 major veins;

Cephalic Vein

A continuation of the vein upward from the antero-lateral aspect of the forearm onto the antero-lateral aspect of the arm over the biceps muscle. From here it passes up to the deltoid muscle where, at a variable point, it passes through the superficial fascia to join the brachial vein to form the axillary vein.

Basilic Vein

A continuation of the vein from the antero-medial aspect of the forearm. It may pierce the superficial fascia in the antecubital fossa and join the deep veins to form the brachial vein or it may traverse the antecubital fossa and pierce the fascia at a variable point on the medial aspect of the arm.

Median Vein

There may be more than one ‘median’ vein in the antecubital fossa. They are formed by the convergence and divergence of branches of the 3 forearm vems.

PRO's

• Large veins and so they will readily accept a large cannula.
• Do not "shut down" as quickly as the more peripheral veins.
• FIRST CHOICE IN THE EMERGENCY SITUATION.

CON's

• Can be very positional due to elbow flexion/extension.
• Can be very uncomfortable for the patient due to elbow flexion/extension.
• Care must be taken not to cannulate the brachial artery.
The Antecubital Fossa.

- Brachial Artery
- Basilic Vein
- Medial Cutaneous Nerve of Forearm
- Med. Cut. N of Forearm and Loop
- Median N
- Median Basilic Vein
- Bicepital Aponeurosis
- Deep Communicating Vein
- Pronator Teres
Veins

Definition
- A collecting system of vessels for blood RETURNING from the peripheries to the heart.
- All veins, except for the pulmonary veins, carry deoxygenated blood and carbon dioxide.

There are 3 venous systems;

Systemic:
Drains blood from all the organs, except for the lungs and G.I. tract back to the right atrium.
This system can be sub-divided into a SUPERFICIAL and DEEP system according to the veins' relationship to the superficial fascia of the body.

Pulmonary:
Drains oxygenated blood from the lungs to the left atrium.

Portal:
Drains blood from the G.I. tract between the gastro-oesophageal junction and the recto-anal junction and carries it to the LIVER. The blood then drains into the systemic system via the hepatic veins.

All veins, except for the superficial systemic veins, have a similar pattern of distribution as arteries, e.g.
- Femoral Vein and Artery
- Carotid Artery and Internal Jugular Vein (external jugular is a superficial vein).

Structure
3 layers like arteries, but;
- There is much less muscle in the media which means the wall is much thinner and is much more easily distended or collapsed by pressure.
- The intima is folded up to form venous valves.

Despite its thinner media the vein retains significant sympathetic innervation and so significant VENOCONSTRICTION can occur leading to collapsed or ‘SHUT DOWN’ veins.

Arteries

Definition
- The vessels carrying blood AWAY from the heart.
- All arteries, except the PULMONARY arteries, carry oxygenated (bright red) blood.

Structure
3 layers

Intima: Consists of an ENDOTHELIUM surrounded by a thin layer of elastic tissue. The endothelial cells are flat and line the vessel to promote the smooth laminar flow of blood. They also release chemical substances involved in the initiation of clotting. More recently it has been discovered that they synthesise and release nitric oxide, a -simple molecule, involved in many physiological and pathological processes.

Media: A thick layer of intermingled smooth muscle cells and elastic fibres.
Its function is to distend as the heart ejects blood into the arterial tree and then to contract back down when the heart goes into diastole. This maintains the normal calibre of the vessel and also promotes forward flow of blood during diastole. This effect can be seen on an arterial line or pulse oximeter trace as a "bump" on the downstroke of the trace.

**Adventitia:**
- A tough fibrous layer.
- This protects the artery and merges in with the surrounding connective tissue.
Patient Assessment

Factors Influencing Vein Choice

Age of patient
Previous uses and condition of the veins
Clinical status of patient e.g. Dehydrated, shock, amputee, mastectomy, oedema, thrombocytopenia, CVA
Other clinical procedures required during admission
Type and length of treatment
Medications: warfarin, heparin, steroids
Patient preference
Patient co-operation, previous experiences
Try to use non dominant arm
Sites: median antecubital veins, forearm veins, dorsum of hands and in difficult patients’ dorsum of foot.

Condition Of Vein

A good vein is:
- Bouncy
- Soft
- Refills when depressed
- Visible
- Has a large lumen
- Well supported
- Straight

A void veins which are:
- Thrombosed / sclerosed / fibrosed
- Inflamed / bruised
- Hard
- Thin / Fragile
- Mobile / tortuous
- Near bony prominences, painful
- Areas or sites of infection, oedema or phlebitis
- In the lower extremities (unless none else available)
- Have undergone multiple previous punctures

Improving Venous Access

- Application of a tourniquet promotes venous distension. The tourniquet should be tight enough to impede venous return but not affect arterial flow.
- Lower the extremity below the level of the heart
- Use muscle action to force blood into the veins - e.g. open and closing of the fist
- Light tapping of the vein
- Apply warm compresses or immerse limb in bowl of hot water to increase vasodilatation
- Consider GTN Patch
Site Preparation

Position the patient appropriately to facilitate the procedure, you may need help.
Choose an appropriate site

Infection Control

Asepsis is vital as the skin is breached and a foreign object is introduced into a sterile circulating system. The main sources of microbial contamination are:
- Cross infection from practitioner to patient
- Skin flora

Hands should be clean, having been washed prior to the procedure, and an alcohol solution/gel applied to the hands before donning a pair of gloves. Gloves will protect your hands against contamination from the patient's blood, and will provide some additional protection in the case of a needle-stick injury by wiping some of the contaminating blood from the needle prior to the skin puncture.

The site of the proposed venepuncture should be wiped with an isopropyl alcohol 70% swab (e.g. mediswab) and this should be allowed to dry (for a minimum of 30 seconds) prior to proceeding with venepuncture. This will clean any gross contamination of the patient's skin and will reduce the patient's skin flora at the site of puncture.

The skin must not be touched or the vein re-palpated once the skin has been cleaned.

Sharps should be immediately disposed of in a sharps container, and no needles should be re-sheathed.

This is to avoid needle-stick injuries to you or others involved in the patient's care, lowering the incidence of blood-borne viral illnesses (In particular Hepatitis B/C and HIV)

Use a no-touch technique for any part of the needle or cannula which is to puncture the patient's skin.
Venepuncture

Procedure Of Venepuncture

Equipment

- Tray
- Mediswab
- Tourniquet
- Small adhesive dressing.
- Sharps Container
- Gloves
- Isopropyl alcohol 70% solution hand rub solution
- ‘Vacutainer’ system
  - needle, holder, appropriate evacuated tubes
  Or
  - Sterile syringe, Sterile needle, Appropriate evacuated tube

Procedure

1. Assemble equipment
2. Inform patient of procedure
3. Select a suitable vein - e.g. the vein in the antecubital fossa or forearm
4. Palpate the vessel to exclude the possibility that it is an artery
5. Apply a tourniquet medial to selected site
6. Put on gloves
7. Cleanse skin with alcohol wipe
8. Fix the vein by applying pressure to skin over the vein, approximately two inches below venepuncture site
9. Leaving the coloured shield on the needle, screw it onto the holder
10. Remove shield and approach the skin, with needle bevel uppermost at an angle of 35~45 degrees
11. When the needle has penetrated the skin, realign it with the vein and reduce the angle to about 15 degrees
12. Introduce the tube into the holder, with middle and forefinger supporting flange of the holder, push the tube with the thumb to the end of the holder, puncturing the diaphragm of the stopper.
13. As soon as blood starts to flow into the tube, remove the tourniquet.
14. When blood flow ceases, gently disengage tube from holder - if more samples are required, repeat from stage 12
15. Tubes with additives should be gently inverted to mix contents - shaking may cause haemolysis.
16. Always draw samples without additives first.
17. Place a clean swab or piece of cotton wool over the needle as it is gently withdrawn, pressure should be applied to the site until haemostasis occurs, at which time an adhesive dressing is applied. It is not recommended that the patient bend their arm as this increases the intravascular pressure.
18. Ensure all samples are clearly labelled
19. Never re-sheath needles as this is the commonest source of needles tick injury.
20. Ensure all sharps are disposed of safely and examine holder for any contamination, in which case it should be discarded - in normal practice the holder does not come into contact with blood products and is intended for multiple use.