

Vascular access

Key Teaching Objectives

Each candidate should receive practical instruction on the following:

1. Intraosseous access and infusion including EZ-IO use
2. Umbilical Vein Catherterisation
3. Demonstration of scalp vein access

Some overseas centres may wish to include the following:

4. Venous cutdown

During the course of this station the indications for and complications of each of the manoeuvres should be revised.

Equipment Required

1. Intraosseous access

- Intraosseous trainer or ALS baby with leg pads
- 5ml syringes x 3
- 50ml syringes x 2
- Intraosseous needles x 3
- Blue food dye x 1
- Jug
- 0.9% Saline 500ml
- Intraosseous trainer [Humerus and tibia].
- EZ-IO Driver
- 10ml syringes x 2
- 10ml amp normal saline
- EZ-Connect® extension tubing
- EZ-IO needle sets
- Giving set
- Pressure bag
- 3 way tap

2. Umbilical vein access

- Artificial Umbilical cords x 3
- Baby Umbi X3
- Umbilical catheters x 6

Umbilical tape x 2
Large waterproof trays x 1
Gloves
Plastic aprons

Environment

The room should be divided into two: one station should be set-up for intraosseous access and infusion, and one for umbilical access. Care should be taken to protect floor and tables where food dye is being used. Each station will require one or two tables, which should be set-up in such a way as to allow free access on all sides.

Plan

Set

“During this session you are going to be taught the sites and equipment available for intraosseous and umbilical vein access and you will be given the opportunity to practice these skills.”

Dialogue

This station is taught using the 4-part technique described in the Pocket Guide to Teaching for Medical Instructors. The following techniques should be taught:

Intraosseous Insertion

A Using a hand held needle

Note: This is the preferred technique in neonates

1. Identify the infusion site. The landmarks for the upper tibial and lower femoral sites are shown below:

Tibial	Femoral
Anterior surface, 2-3 cm below the tibial tuberosity	Anterolateral surface, 3 cm above the lateral condyle



Immediate Vascular Access... When You Need It.SM

Identifying the pediatric EZ-IO insertion site

If the Tibial Tuberosity **CANNOT** be palpated the insertion site is two finger widths below the Patella (and then) medial along the flat aspect of the Tibia



The Tibial Tuberosity can be difficult or impossible to palpate on younger patients

2. Clean the skin over the chosen site
3. Insert the needle at 90° to the skin, emphasise the rotational motion
4. Continued to advance the needle until a give is felt as the cortex is penetrated, a clear give is felt
5. Attach the 5 ml syringe and aspirate or infuse to confirm correct positioning with as minimal movement as possible. Flush is usually required to achieve good flow.

B Using a Powered Device

The EZ-IO drill is a powered device which enables rapid insertion of an intraosseous needle. The same landmarks are used as for manual insertion and the procedure is less painful for the conscious victim due to its rapidity. The EZ-IO needles are in three sizes - under 30 kg and over 30-50 kg and adult.

Note: Hand held needle is the preferred technique in neonates

The procedures for insertion is as follows:

1. Universal precautions. Prime connection line.
2. Clean site.
3. Choose appropriate size needle and attach to drill - it will fix magnetically.
4. Hold the drill and needle at 90 degrees to the skin surface and push through the skin without drilling, until bone is felt.
5. Push the drill button and drill continuously and push until there is loss of resistance - there is a palpable give as the needle breaches the cortex.
6. Remove drill and unscrew trochar (holding the needle in place with as minimal movement as possible).
7. Aspirate marrow if possible.
8. Attach pre-prepared (primed with NS) connection tube. Flush is usually required to achieve good flow
9. There is an optional device to secure the needle but this is not essential.
10. Proceed with required therapy.

Intraosseous Fluid Infusion

- Fluid will not run through the IO by gravity
- Attach a 3 way tap. To this tap attach the filled 50 ml syringe and a fluid giving set attached to a bag of normal saline
 - Turn the tap so fluid is drawn into the syringe from the bag
 - Turn the tap so the fluid bolus can be pushed though the cannula

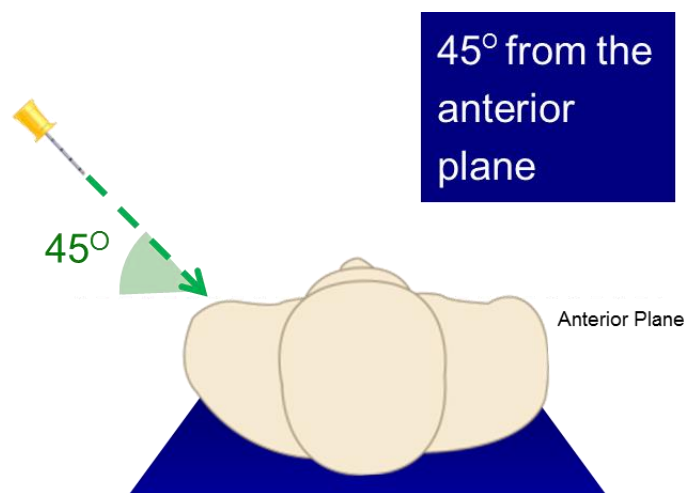
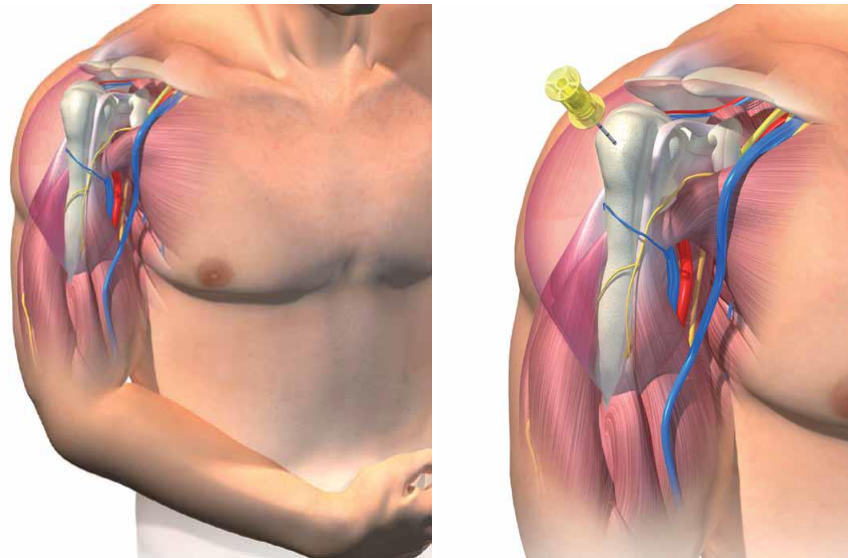
It should be noted that rapid infusion of fluid may be painful for the conscious patient and if this proves to be the case 0.5mg/kg of 2% lignocaine may be infused slowly to combat this.

Intraosseous access

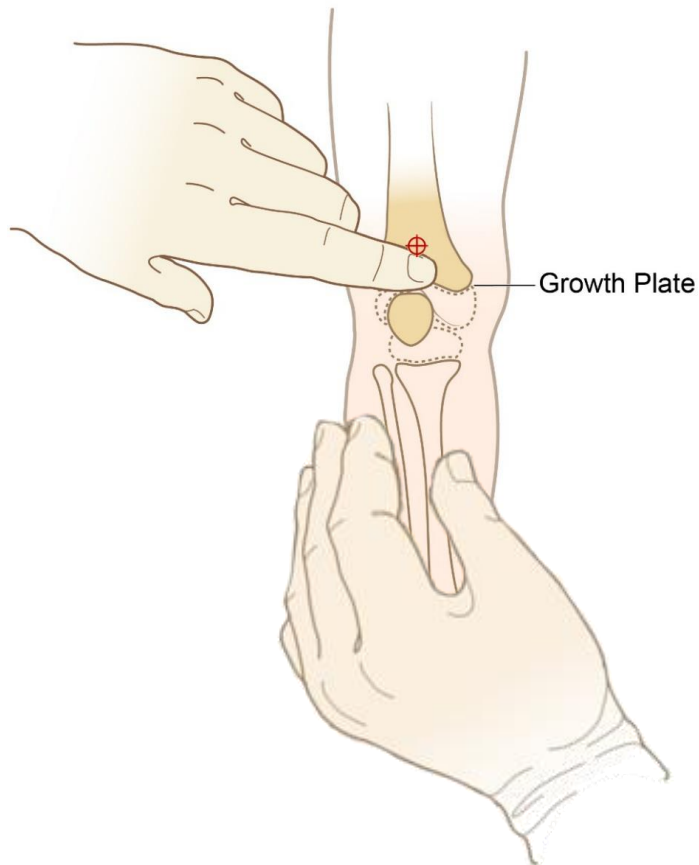
Humeral access

Place the patient's hand over the umbilicus: Causes medial rotation of elbow and humerus

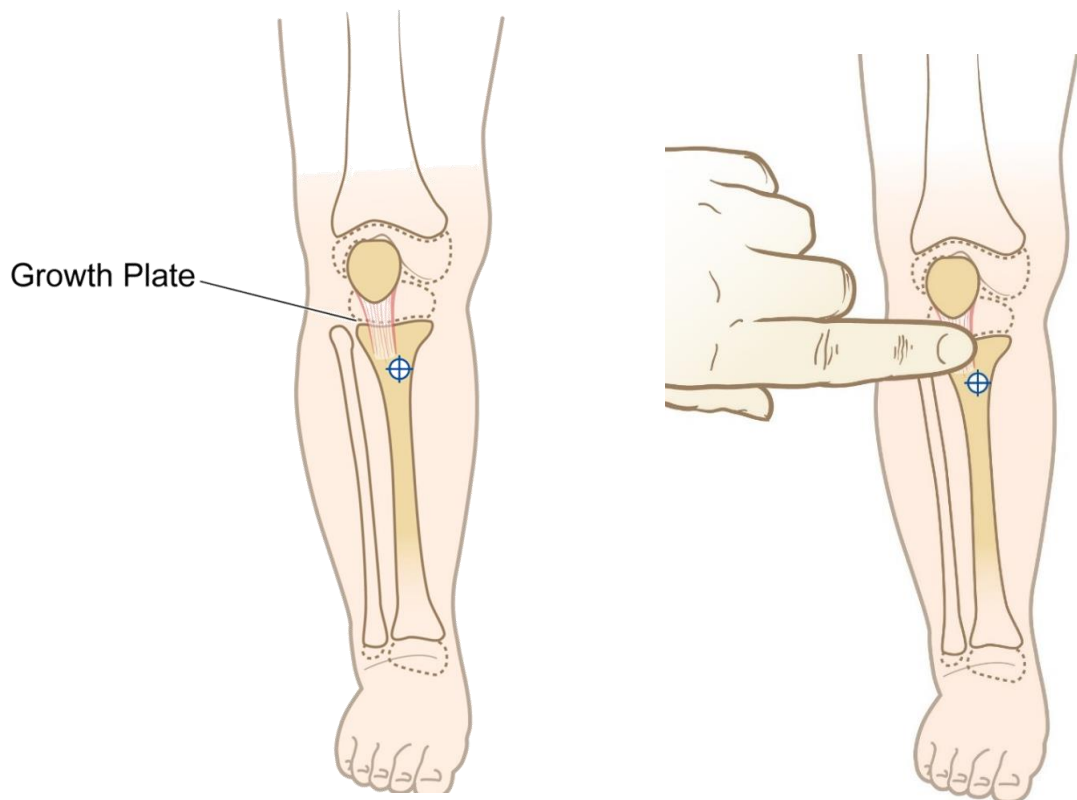
Adduct the arm: Provides greater prominence of insertion site



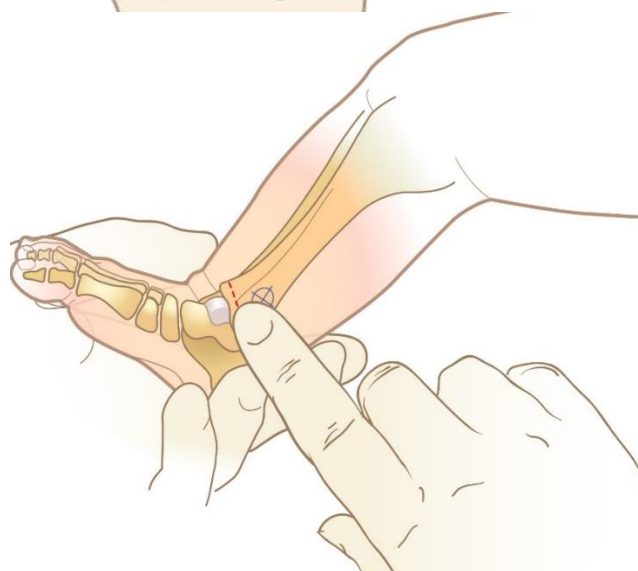
Proximal Tibia Insertion Site Identification – Infant/Child



Distal Femur Insertion Site Identification - Infant/Child



Distal Tibia Insertion Site Identification – Infant/Child



Umbilical Vein Access

1. Loosely tie the umbilical tape around the artificial cord.
2. Cut the cord with a scalpel, leaving a 1cm strip distal to the tape. (this can be demonstrated but not practiced)
3. Identify the umbilical vein. 3 vessels will be seen in the stump. Two will be small and contracted (the arteries sited inferiorly), and one at the head end will be dilated (the vein).
4. Fill a 5 fr gauge catheter with 0.9% saline.
5. Insert the catheter into the vein, and advance it approximately 5cm.
6. Tighten the umbilical tape to secure the catheter. A purse string suture may be used later to stitch the catheter in place.

Optional

Scalp vein cannulation

Scalp vein trainer (optional)
IV cannulae 18-25 g x 2
Rubber tubing x 1

Venous cutdown

Venous cutdown feed x 2
Small BP Scalpel handles x 2
Scalpel blades size 15 (boxes) x 1
Curved haemostats x 6
Strong black cotton x 3
Cannulae 14-25 x 2

Assessment Technique

A record of candidates' performance during the station should be kept for faculty reference.

Resources in kits:

[https://www.rch.org.au/uploadedFiles/Main/Content/neonatal_rch/clinical_practice_guidelines/UVC%20Newborn\(2\).pdf](https://www.rch.org.au/uploadedFiles/Main/Content/neonatal_rch/clinical_practice_guidelines/UVC%20Newborn(2).pdf)

<http://www.slhd.nsw.gov.au/rpa/neonatal/html/docs/uvc.pdf>