INSERTION SITES, LANDMARKS AND INSERTION ORIENTATION

Practitioners must become familiar with the sites, symptoms, interventions and preventive measures for catheter-related complications at all insertion sites.

EXTERIOR JUGULAR (EJ)

LANDMARKS
- neck in part of surface anatomy

INSERTION ORIENTATION
- site can be instrumented into vein as specified in the neck

ADVANTAGES
- easy to locate, stable

DISADVANTAGES
- difficult to obtain refluxing needle, valvular, tension, phlebitis
- higher complication rate compared to other sites (thrombophlebitis, infection)
- prone to patients with thrombocytopenia
- difficult dressing maintenance

INTERNAL JUGULAR (IJ)

LANDMARKS
- angle of mandible
- two heads of sternocleidomastoid muscle
- external jugular vein
- internal jugular vein

INSERTION ORIENTATION
- Central: Insert needle at angle to vein formed by the two heads of the sternocleidomastoid muscle and the clavicle. Insertion depth 3 cm–10 cm.
- Internal: Insert needle at multiple of the sternoclavicular joint, 4 cm from the angle of the mandible and 4 cm towards the foot, directed superiorly. Insertion depth 2 cm–6 cm.

ADVANTAGES
- large wound size
- easy to dislocate
- short, straight path to superior vena cava
- right side
- low complication rate

DISADVANTAGES
- close proximity to cardiac artery
- higher infection rate compared to other sites
- prone to patients with disseminated intravascular coagulopathy
- difficult dressing maintenance

SUBCLAVIAN

LANDMARKS
- clavicle
- two portions of sternocleidomastoid muscle
- supraclavicular fossa

INSERTION ORIENTATION
- InfrACLAVIAL: Insert needle at a 20–30° angle to the clavicle at where the clavicle starts towards the sternum. Insertion depth may be as much as 10 cm.
- superficial: Insert needle at the angle formed by the clavicle and the sternoclavicular joint at 40 degrees. Insertion depth 1 cm–4 cm.

ADVANTAGES
- large vessel with high flow rate
- lower infection rate compared to other sites
- easy to maintain dressing
- less restricting for patient

DISADVANTAGES
- close to the axillary vein
- subclavian vein
- internal thoracic artery
- phrenic nerve
- subclavian artery
- needle can be inserted into vessel as required

AXILLARY

LANDMARKS
- clavicle
- infrACLAVIAL: insertion on clavicle
- clean, smooth skin

INSERTION ORIENTATION
- Ultrasound-guided, transverse view of plane: The approach is a direct approach to the lateral portion of the subclavian vein. The shaft of the needle is oriented throughout the course of the insertion. Insertion depth, 1–3 cm.

ADVANTAGES
- large vessel with high flow rate
- lower infection rate compared to other sites
- easy to maintain dressing
- easy to control bleeding
- quick return of blood
- reduced infection

DISADVANTAGES
- potentially a longer healing curve than the IJ site
- difficult to dislocate
- prone to the subclavian artery

CEPHALIC VEIN

ADVANTAGES
- easy access for insertion and care
- easy to palpate and locate easily

DISADVANTAGES
- small vessel, easily blocked
- venous return may vary from person to person
- difficult to insert due to subclavian sites

REDUCING RISKS: Avoid using femoral vein for catheterisation. Assess all central venous catheters after a period of no longer than necessary.
**PRINCIPLES OF VASCULAR ACCESS INSERTION**

**VASCULAR ACCESS DEVICE-DECISION TREE**

- Patient requires IV therapy
  - Osmanyt < 600 mOs/m; and pH < 5.5 or pH > 9; or irritant or vesicant infusions; and short term (≤ 4 weeks)
  - Osmanyt > 600 mOs/m; or pH 5.5 ≤ pH < 9; and non-irritant and non-vesicant infusions; and for both short term (≤ 4 weeks) and long term (> 4 weeks)
  - Peripheral line
  - Inpatient
  - Outpatient
  - Central line
  - Duration ≤ 4 weeks
  - Continuous therapy
  - Duration > 4 weeks
  - Non-continuous therapy
  - Duration < 1 year
  - Continuous therapy
  - Duration > 1 year

**USING RAULERSON SYRINGE**

- After administering local anesthetic, secure venostomy using hemostatic monitor or checking for possible blood flow. Place heparin ice on usually an indicator of inadvertent arterial puncture.
- Warning: The colour of blood is not always an accurate indication of venous entry.
- Using a seconal-wire guide advanced into a catheter until free from venipuncture.
- Hold spring wire guide in place and remove needle.
- If using tissue dilator, pass it over spring wire guide to enlarge site as needed.
- Thread tip of catheter over spring wire guide allowing spring wire guide to exit hub.
- Grasping catheter near skin, advance into vein with a slight twisting motion.
- Advancing catheter into the needle hub position. Hold catheter and remove spring wire guide. Check lumen placement by aspirating through hub.

**REDUCING RISKS:**

- There are two key benefits to using the Raulerson syringe. First, it lowers the exposure to blood and can lower the risk of an embolism. Second, it enables you to place the catheter in fewer steps, with less risk of dislodging needle from vessel.

**MODIFIED SELDINGER TECHNIQUE**

- Catheter needle assembly may be used in place of the thermowell introducer needle.
- Remove needle from syringe. Suture catheter in venous.
- Immediatedly secure catheter entry to prevent air embolism or bleeding.
- Using the spring wire guide advanced into a catheter until free from venipuncture.
- Hold spring wire guide in place and remove needle.
- If making skin-nick, enlarge incision with a scalpel, then advance the dilator.
- Tissue dilator in place as an indwelling catheter.
- Avoid the subclavian site in hemodialysis patients and patients with advanced kidney disease, to avoid subclavian vein stenosis.

**CENTRAL LINES REPLACEMENT & REMOVAL**

- Use ultrasound guidance to place central venous catheters and remove lines as needed.
- Promptly remove any intravascular catheter that is no longer essential.

**RECOMMENDATIONS FOR CENTRAL LINES INSERTION & REMOVAL**

**HARD HINGE AND ASETIC TECHNIQUE**

- Maintain aseptic technique for the insertion and care of intravascular catheters. Category IB.
- Sterile gloves should be worn for the insertion of arterial, central, and midline catheters. Category IA.

**MAXIMAL STERILE BARRIER PRECAUTIONS**

- Use maximal sterile barrier precautions, including the use of a cap, mask, sterile gown, sterile gloves, and sterile field during the insertion of CVCs, PICCs, or central venous catheter exchanges. Category IB.

**SKIN PREPARATION**

- Prepare skin clean with a 0.5% chlorhexidine soap preparation with alcohol barrier central venous catheter and peripheral arterial catheter insertion and during dressing changes. If the use of chlorhexidine is contraindicated, another barrier (talc, iodine, or alcohol) should be used initially. Category IA.

**SELECTION OF CATHETERS AND SITES**

- Susha the risks and benefits of placing a central venous catheter and peripheral arterial catheter in a patient with advanced kidney disease, to avoid subclavian vein stenosis. Category IA.

**REFERENCES**