

Intraosseous Needle Placement

- The bone marrow is a non-collapsible structure with a rich venous plexus. It can provide a rapid and reliable route for administering crystalloids, blood products, vasopressors, and other drugs into the central circulation within seconds from the time of injection.
- Intraosseous needle (IO) placement can provide emergency vascular access in a child for emergent intravenous fluid & medication administration when peripheral access is unobtainable. This technique can be used on patients of all ages and is preferred over the endotracheal route for administering emergency medications.

Contraindications:

- Cellulitis overlying the insertion site (in the absence of other alternatives, cellulitis overlying the selected site does not preclude IO placement)
 - Inferior vena caval injury (the fluid infused must be able to drain into the central circulation. If this injury is suspected, central venous access superior to the injury is preferred)
 - Recent failed attempt on the same bone
 - Osteogenesis imperfecta because of a higher likelihood of fractures occurring
 - Osteopetrosis
 - Fracture of involved bone
- Although products specifically designed for IO access are ideal, a stylet needle used for bone marrow aspiration or a large adult spinal needle can be used in an emergency.
- Common insertion sites
 - ▶ Tibial plateau: the flat medial surface of the proximal tibia 1 to 2 cm below the tibial tuberosity.
 - ▶ Distal femur: 3 cm above the superior aspect of the patella.
 - ▶ Distal tibia, radius, and ulna; iliac crests; or sternum (use extreme caution if trying insertion at this site in a young child).

Technique for Tibial Plateau Placement

- Place the knee in approximately 30 degrees of flexion.
- Apply rigid support to the posterior aspect of the insertion site (do not place your hand directly posterior to where the needle will be driven)
- Insertion site is approximately 1-2 cm medial to the tibial tuberosity, along the flat aspect of the tibia. Pinch the tibia between your fingers to find the center.
- Using an aseptic technique, prepare the selected site
- In an awake patient, infiltrate the skin and subcutaneous tissue with local anesthetic.
- If using a bone marrow aspiration needle, after penetrating the skin, direct the IO needle at a slight angle (10°–15°) caudad (in the femur, angle it cephalad) and apply pressure with a to-and-fro rotary motion. Avoid “wobbling” the needle during insertion, which may result in needle fracture.
 - ▶ As the needle passes from the cortex of the bone into the marrow, resistance will diminish.
 - ▶ Remove the stylet and check needle placement by attaching tubing connected to a saline-filled, 10-cc syringe. The needle should stand securely in the bone without support.
 - ▶ Bone marrow can be aspirated, and fluid should be easily infused.

- Blood withdrawn from the needle may be sent to the laboratory for basic testing, including a complete blood count, electrolytes, glucose, and the like.
- Observe for fluid infiltration of the calf; if this occurs, repeat the attempt in the opposite leg. If placement is unsuccessful, do not try again in the same extremity.
- Apply antibiotic ointment and a sterile dressing to the site and secure the tubing to the leg with sterile gauze.
- Minimize needle manipulation by attaching syringes or a stopcock to tubing which is directly attached to the needle
- Maintain vigilant care and observation of the insertion site; accidental dislodgement of an IO needle will manifest as fluid extravasation into a swollen calf, or the needle will be mobile at the site.
- Once the emergent condition has resolved and the child has been successfully resuscitated, attempt peripheral or central IV access, as IO lines are notoriously short lived (< 24 hours)

If using EZ-IO for Proximal Tibia Insertion

- Choose proper needle length:
 - 15mm (3-39kg)- pink
 - 25mm (> 40kg) - blue
 - 45mm (humeral placement or large patients with excess overlying tissue) - yellow
- Aim the needle set at a 90-degree angle to center of the bone
- Push the needle set tip through the skin until the tip rests against the bone
- The 5mm mark must be visible above the skin for confirmation of adequate needle set length
- Gently drill, immediately release the trigger when you feel the “pop” or “give” as the needle set enters the medullary space
 - Avoid recoil – do NOT pull back on the driver when releasing the trigger
- Hold the hub in place and pull the driver straight off
- Continue to hold the hub while twisting the stylet off the hub with counterclockwise rotations
 - The catheter should feel firmly seated in the bone (1st confirmation of placement)
- Place the stylet in a sharp’s container
- Place the EZ-Stabilizer™ dressing over the hub
- Attach a primed EZ-Connect® extension set to the hub, firmly secure by twisting clockwise
- Pull the tabs off the EZ-Stabilizer dressing to expose the adhesive, apply to the skin
- Aspirate for blood/bone marrow (2nd confirmation of placement)
- Complications include:
 - Osteomyelitis
 - Fracture (of bone or needle)
 - Injury to the epiphyseal plate
 - Bleeding
 - Extravasation of fluid
 - Loss of vascular access
 - Extravasation
 - Compartment syndrome
 - Hematoma
 - Pressure necrosis of the skin
 - Fat emboli