The University of Texas Medical Branch
Intraosseous (IO) Overview (Mar 2020)

General Principles

1. The basic principle of intraosseous infusion is the vascularity of the bone. The IO space provides access to the noncollapsible venous plexus; drug delivery is similar to that achieved by central venous access.

2. **Indications** for the insertion of an intraosseous catheter include short-term treatment when intravascular access cannot be achieved.

3. **Contraindications** for the insertion of an intraosseous catheter include:
   - **a.** Placement in a fractured bone or in a limb with vascular injury
   - **b.** Previous significant orthopedic procedure at the site, prosthetic limb or joint
   - **c.** Infection at area of insertion site
   - **d.** Excessive tissue and/or absence of adequate anatomical landmarks
   - **e.** Once a bone has been punctured by an IO attempt it cannot be used again for a time period of 48 hours

4. Individuals who may insert an intraosseous catheter include:
   - **a.** Trained physicians who have completed the required Intraosseous catheter training under the direction of a credentialed faculty member
   - **b.** Specially trained nurses who have completed required training may insert IO's in emergent/urgent patient scenarios, such as resuscitation.

Administration of Medications & Monitoring

Nurses who have completed required training will assume primary responsibility for the following:

a. Administration of medications via the intraosseous catheter
b. Monitoring of the IO site for signs of complications
c. Notification of the ordering provider if any complications develop

Flushing the catheter prior to use will help facilitate flow: NO FLUSH = NO FLOW
5-10 ml of 0.9% normal saline for adult patients
2-5 ml of 0.9% normal saline for pediatric patients
The catheter should be flushed before and after medication administration.

Dosage of medications or infusions are equivalent when comparing intraosseous and intravenous. Administration of medications via intraosseous access is considered preferable in comparison to endotracheal administration.

Fluids or medications that can be safely administered via peripheral IV may be infused through the IO. One exception is chemotherapy agents; the IO should not be used for chemotherapy. Caution should be used with repeat doses of hypertonic fluids.

Avoid rocking or bending the EZ-IO catheter during use

Pain Management In Conscious/Awake Patients:

Pain Management in the Conscious/Awake ***Adult*** Patient:
1.) Infiltration of the area with 1% lidocaine may be used prior to insertion if indicated.
2.) If indicated, prior to IO syringe bolus (flush) or continuous infusions in alert patients, SLOWLY administer Lidocaine 2% without epinephrine (Preservative Free) through the EZ-IO hub. Ensure that the patient has no allergies or sensitivities to Lidocaine. With each administration, allow lidocaine to dwell for 1 minute, then flush the catheter.
Usual Dosage: 40 mg of 2% Lidocaine for adults (rate: over 2 minutes). Patient may require repeat doses and/or systemic pain control.

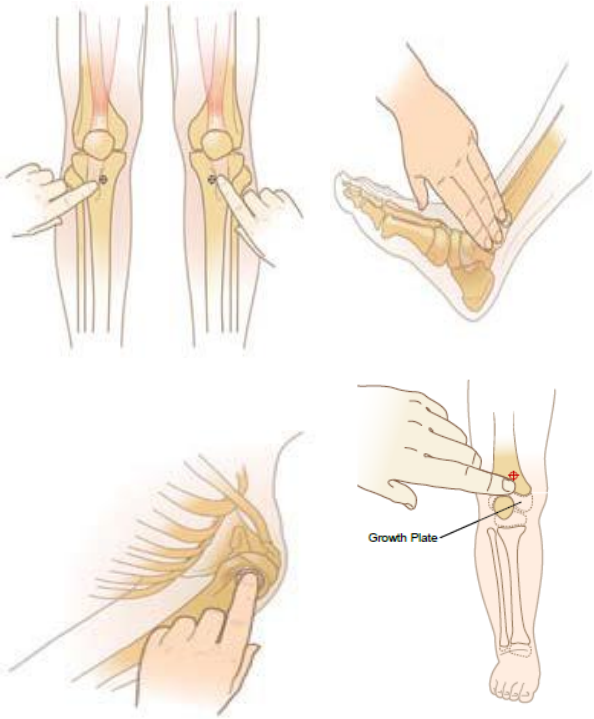
Pain Management in the Conscious/Awake ***Pediatric*** Patient:
The EZ-IO product vendor advocates Lidocaine IO for pain relief in Pediatric patients. However, due to lack of appropriate evidence-based literature, Lidocaine will NOT routinely be given IO to Pediatric patients at UTMB for pain control. Pain management will be at the discretion of the physician managing the patient at the time of resuscitation.

Procedure

1. Aseptic technique and standard precautions shall be utilized.
2. Locate appropriate insertion site
   (Note: site selection depends on many patient factors. If possible, avoid a humerus site on the same side as a mastectomy)

Insertion Sites

a. Proximal/Distal Tibia
b. Proximal Humerus
c. Distal femur (pediatrics)



Needle size and length:
1.) 15-gauge, 15 mm long needles
2.) 15-gauge, 25 mm long needle
3.) For patients with excessive tissue and for the proximal humerus site in adults: 15 gauge, 45 mm long needle

3. After insertion, connect primed extension set (note: the volume of the EZ-Connect is approximately 1.0 ml).
4. Dress site (opsite may be preferred to visualize the site) and secure tubing. The EZ-IO stabilizer dressing may also be used.
5. Apply yellow wristband to patient. Add date and time of insertion to wristband
6. Monitor site and patient condition. REMOVE CATHETER WITHIN 24 HOURS.

Confirmation of Placement

The following are examples of ways confirmation of placement can be accomplished:

1. The catheter is firmly seated (stable) and does not move
2. You are able to aspirate blood or marrow from the catheter (inability does not necessarily mean that insertion was unsuccessful; consider reattempt after flushing)
3. Adequate flow rates

The EZ-IO is made of 304 stainless steel; MRI procedures are contraindicated while in place.

Ambulation should be discouraged with a lower extremity EZ-IO catheter in place. For the humerus, movement in the affected arm should be minimized. There are no activity restrictions after EZ-IO removal.

Blood sampling for laboratory testing from the IO is acceptable on a limited basis. Acceptable testing includes cultures and chemistry (except CO2 Total). Sampling from the IO is not acceptable for hematology, coagulation, or blood bank testing. All samples obtained from an IO should be labeled with this information. Individual questions or concerns regarding sampling from the IO for a specific patient should be directed to the Clinical Laboratory (Attn: Director on-Call for the specific laboratory service).

The most common complication is extravasation or infiltration. This is evidenced by local swelling of surrounding tissue, increased circumference of the affected extremity, or increased infusion resistance. If extravasation is detected, the intraosseous device should be removed, and the patient should be closely monitored for the development of compartment syndrome.
Other complications may include infection, compartment syndrome, bone fractures, embolism, and osteomyelitis.

Discontinuation of the IO Catheter

1. The intraosseous catheter must be removed **within 24 hours of insertion**
2. Physicians and specially trained nurses who have completed the required training will discontinue the intraosseous catheter
3. If the patient deteriorates and IO access is required again, bone that has been accessed cannot be accessed again for a time period of 48 hours

Documentation

Documentation may include:

- Indications and absence of contraindications (procedure note)
- IO site, use of anesthetic, adult or pediatric IO
- Patient tolerance of procedure, # of attempts (if more than one)
- Date and time of insertion
- Date and time of discontinuation
- Assessment of site for signs of infection and/or extravasation
- Patient and/or family teaching

Intraosseous Reference List

American Heart Association (2016). Advanced Cardiovascular Life Support. Provider Manual.

Arrow EZ-IO Intraosseous Vascular Access System. 2017 The Science and Fundamentals of Intraosseous Vascular Access. Accessed 3/3/2020 from https://www.teleflex.com/usa/en/clinical-resources/ez-io/documents/EZ-IO_Science_Fundamentals_MC-003266-Rev1-1.pdf.

INS Position Paper, (nd) The role of the registered nurse in the insertion of intraosseous access devices. Accessed 3/3/2020 from https://www.learningcenter.ins1.org/position-papers.

American College of Emergency Physicians. (2017). Alternative Methods to Vascular Access in the Emergency Department. Accessed 3/3/2020 from https://www.acep.org/globalassets/new-pdfs/policy-statements/alternative-methods-to-vascular-access-in-the-emergency-department.pdf.