

**9I - VASCULAR ACCESS - INTRAOSSEOUS
ADULT & PEDIATRIC**

EMT-INTERMEDIATE 85

ADVANCED EMT

PARAMEDIC

Indications:

1. First-choice access in cardio/pulmonary arrest (unless IV access can be achieved as timely).
2. Second-choice access in dynamic, life-threatening shock or respiratory failure (if IV access cannot be achieved in clinically needed time).

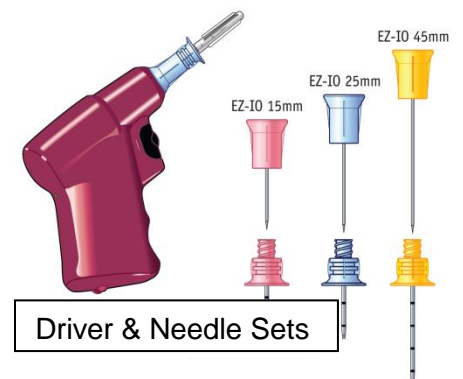
Contraindications:

1. Inability to locate anatomical landmarks (blind insertion contraindicated).
2. Suspected cellulitis at insertion site.
3. Suspected acute or non-healed fracture proximal to foot in same leg (proximal tibial insertion) or proximal to forearm in same arm (humeral head insertion).
4. Suspected total knee arthroplasty/replacement (proximal tibial insertion).
5. Suspected markedly poor circulation extremity (history of amputation, gangrene, bypass).

Technique (Vidacare® EZ-IO® System – see protocol Special Note):

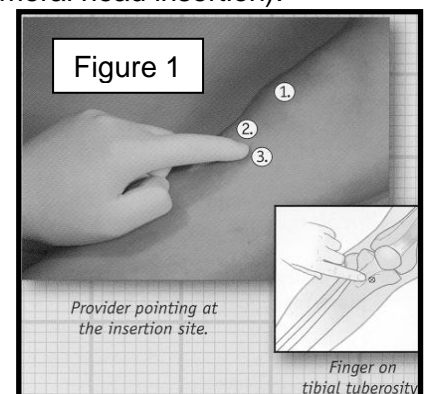
A. Assemble following materials:

1. Driver with Needle Set based on patient size and weight:
15mm 3-39 kg (PINK);
25mm 40kg and greater (BLUE);
45mm 40kg and greater (excessive tissue) (YELLOW).
2. EZ-Connect® 90 degree connection set.
3. Alcohol wipe (or Chloraprep® or equivalent if available).
4. Saline flush syringe.
5. 1 mg/kg Lidocaine (up to 40mg) for intraosseous push if patient responsive.
6. Pressure infuser.
7. EZ-IO® Stabilizer (optional if proximal tibia insertion; required if humeral head insertion).



B. Locate insertion site:

1. Proximal tibia site (Figure 1). This is the preferred site unless contraindicated as detailed above.
2. Palpate patella (1). Palpate tibial tuberosity (2) approximately two fingers widths below patella in adults and adolescents, or one finger width below patella in smaller pediatrics. Insertion (3) at one finger width medial to tibial tuberosity in the tibial plateau.



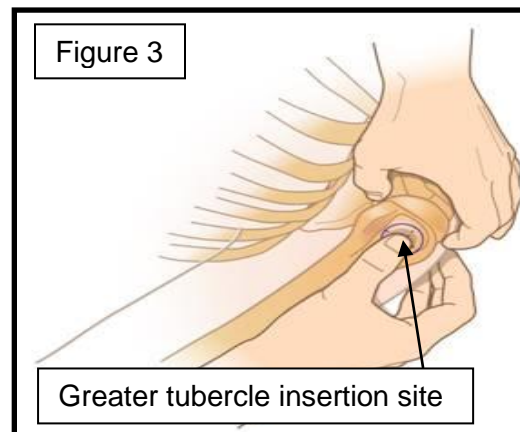
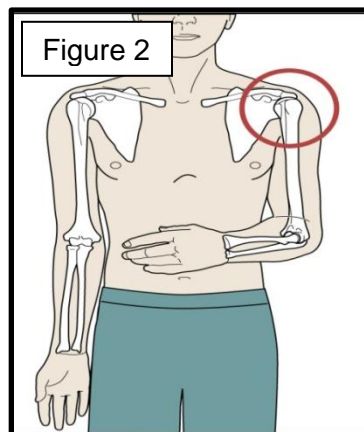
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B. Locate insertion site (cont.)

2. Humeral head site. Extra precision should be taken when utilizing this site. The anatomy proves more difficult to locate, the insertion area is smaller, and the IO needle is more prone to dislodgement due to a thinner bony cortex and higher likelihood of inadvertent EMS provider contact with the IO line.

Position arm in 90 degree flexion, with elbow kept to side of trunk (Figure 2). This position helps to gain maximal “exposure” of the humeral head.

Palpate and identify the mid-shaft humerus and continue palpating with a thumb proximal toward the humeral head. Near the shoulder, note a small protrusion. This is the base of the greater tubercle insertion site. With the opposite hand “pinching” the anterior and inferior aspects of the humeral head, confirm the identification of the greater tubercle in the midline of the humerus. (Figure 3).

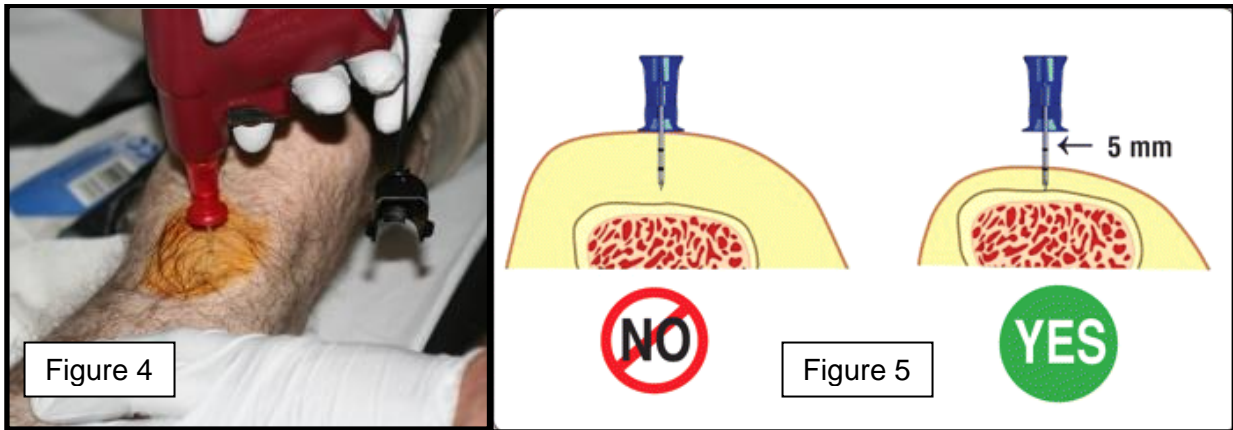


C. Clean insertion site with alcohol wipe, or preferably with Chloraprep[®] or equivalent swab.

D. Access the intraosseous space.

1. Stabilize anatomy near the insertion site with non-dominant hand.
2. Position driver at insertion site with needle at 90 degree angle to the surface of the bone. Use driver to insert needle through the skin at the insertion site until you feel the needle tip encounter bone. Allow the driver to perform its function of progressively inserting the needle. Avoid strong, downward pressure on the needle and maintain constant driver drilling speed. (Figure 4 next page – proximal tibia insertion site depicted)
3. Once the bone cortex feels encountered, ensure use of proper sized needle by checking for visualization of at least one 5 mm mark line (solid black circumferential line on the needle). If at least one 5mm mark line is not visible, a longer needle will be required to achieve useable intraosseous access. (Figure 5 next page)

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4. Resume use of driver to insert a properly-sized needle through the bony cortex and into the bony marrow (evident with a sudden decrease in resistance to needle insertion), maintaining the 90 degree angle to the surface of the skin. Most typically, properly-sized needles will have their hub resting on the skin surface at the time the needle tip is correctly in the marrow space.
- E. While stabilizing the needle hub with a thumb and an index finger, disengage the driver from the needle in a gentle, upward motion.
- F. While still stabilizing the needle hub with a thumb and an index finger, remove the stylet by rotating it counterclockwise until disengaged.
- G. Do NOT attempt aspiration of blood or marrow via the catheter. Pulling marrow into the catheter may clog the catheter and prevent its use for needed fluid and/or medication administration. Do confirm proper EZ-IO[®] catheter placement using a combination of the following signs:
 - a. IO catheter rests at 90 degree angle and feels firmly in bone when grasping hub.
 - b. Blood-tinged marrow oozes spontaneously from hub (may often be absent, yet the catheter is still correctly placed).
 - c. Fluid and medication administration is possible without significant resistance and without extravasation.
- H. When using the proximal tibia insertion site, use of the EZ-Stabilizer[®] (Figure 6 – next page) is optional and its use is determined by the EMT-Intermediate's or EMT-Paramedic's judgment. When using the humeral head insertion site, use of the EZ-Stabilizer[®] is required to reduce the chances of inadvertent dislodgement (refer to earlier discussion of humeral head insertion site). If the EZ-Stabilizer[®] is used, it must be applied prior to connecting the 90 degree connector set to the catheter hub.

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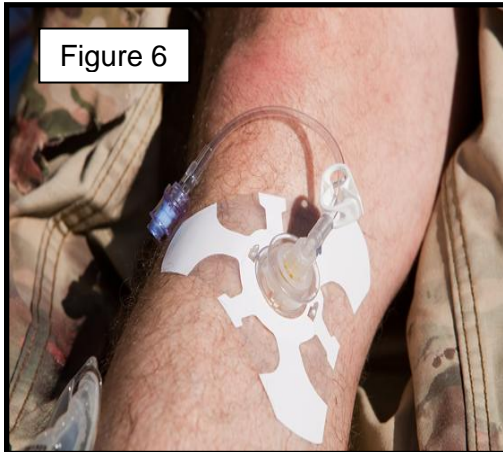


Figure 6

- I. The EZ-Connect[®] 90 degree connector set (also seen in Figure 6) is used to prevent excessive pressure on the catheter when infusing fluids or administering medications. Failure to use the 90 degree connector set can cause inadvertent dislodgement due to excessive pressure down the catheter. Flush the EZ-Connect[®] set with Normal Saline prior to attaching it to the catheter hub and then flush the line to flush the catheter with 10mL Normal Saline if patient unresponsive or Lidocaine 2% 1mg/kg up to 40mg slow intraosseous push if the patient is responsive and clearly able to sense pain. If using Lidocaine as directed, follow with 10mL Normal Saline flush.

- J. Medication administration is given in the same dosing as with IV administrations.
- K. Fluid administration will require the use of a pressure infuser on the IV fluid bag. Due to the increased pressure of the marrow space, IV fluid will not infuse without assistance of the pressure infuser. Inflate pressure infuser until IV fluid is seen infusing with constant flow. Monitor for extravasation and monitor for need to reinflate pressure infuser.

Complications of intraosseous line placement attempts:

Through and through bone penetration – avoid by using correct needle and insertion technique. Extravasation – avoid by using correct needle and insertion technique. Monitor ongoing use and stop at early signs of extravasation. Fracture of bone – avoid by using correct insertion technique (avoid excessive pressure). Infection – avoid by using aseptic technique and do not insert through suspected cellulitis. Growth plate injury in pediatrics – avoid by choosing correct insertion site.

Special Note:

This protocol utilizes the Vidacare[®] EZ-IO System[®] to illustrate one method of achieving intraosseous access. The Oklahoma State Department of Health and the University of Oklahoma Department of Emergency Medicine EMS Section do not exclusively endorse the Vidacare[®] EZ-IO System[®] for intraosseous access by EMS professionals. Check with your EMS system's medical oversight physician(s) for specific protocol directions on equipment to be used in establishing and maintaining intraosseous access if not using the Vidacare[®] EZ-IO System[®].