Intraosseous Access & Infusion - 30.090

DEFINITION:
Intraosseous cannulation is an alternative technique for establishing IV access in critical adult and pediatric patients when peripheral IV access is difficult or time-sensitive.

INDICATIONS:

A. Intraosseous infusion is indicated in emergency situations when life-saving fluids or drugs should be administered and IV cannulation is difficult, impossible or too time-consuming to perform.
B. If a peripheral IV cannot be established after two attempts or within 60–90 seconds of elapsed time *and* in:
C. Adult and pediatric patients, within the proper weight range, who present with one or more of the following clinical conditions:
    1. Cardiac arrest.
    2. Hemodynamic instability (BP <90 mmHg and clinical signs of shock).
    3. Imminent respiratory failure
    4. Status epilepticus with prolonged seizure activity greater than 10 minutes, and refractory to IM anticonvulsants. Hemodynamic instability (BP <90 mmHg and clinical signs of shock).
    5. Toxic conditions requiring immediate IV access for antidote.
D. IO placement may be considered prior to peripheral IV attempts in cases of cardiopulmonary or traumatic arrest, in which it may be obvious that attempts at placing an IV would likely be unsuccessful and or too time consuming, resulting in a delay of life-saving fluids or drugs.

EZ-IO™ PROCEDURE:

A. Determine patient's weight.
B. Assemble all necessary equipment
    1. The Standard EZ-IO AD® needle should be utilized on patients who weigh ≥ 40 kg (approximately 88 lbs. or greater).
    2. The EZ-IO PD® needle should be used on patients who weigh between 3–39 kg (approximately 6–87 lbs.).
C. Site Selection (patient's weighing ≥ 40 kg).
    1. Tibia
        a) Palpate the landmarks at the proximal tibia (patella and tibial tuberosity).
        b) Insertion site should be approximately one finger width to the medial side of the tibial tuberosity.
        c) An alternate site may be used at the distal tibia, two finger widths proximal to the medial malleolus along the midline of the tibia.
    2. Proximal Humerus
        a) Insertion site is located directly on the most prominent aspect of the greater tubercle. Slide thumb up the anterior shaft of the humerus until you feel the greater tubercle, this is the surgical neck. Approximately 1 cm (depending on patient anatomy) above the surgical neck is the insertion site.
        b) Ensure that the patient's hand is resting on the abdomen and that the elbow is adducted (close to the body).

D. Needle Insertion
   1. Prep the surface with Betadine® and wipe dry with a sterile gauze pad.
   2. Stabilize patient's leg and begin insertion from a 90-degree angle to the plane of the tibial plateau. Gently advance the needle set into position–do not force. Stop when you feel the "pop" on smaller patients.
   3. When needle is in proper position, remove stylet (if insertion fails, leave the needle in place and clamp the EZ-Connect; do not attempt second insertion on same leg).
   4. Connect extension tubing or EZ-Connect, primed with saline, to IO hub.
   5. Confirm the catheter position (catheter is stable at a 90-degree angle to the bone, able to aspirate blood, and fluids flow without evidence of extravasation).
   6. Rapid bolus or "power" flush with approximately **10 ml Normal Saline** when using the EZ-IO AD® needle, and 5 ml normal saline when using the EZ-IO PD® needle.
   7. Connect IV tubing and bag to extension tubing or EZ-Connect.
   8. Consider additional bolus of saline if flow rates slower than expected.
   9. Utilize a blood pressure cuff or pressure bag to help infuse fluids.
   10. Dress site, secure tubing, and apply wristband.

E. Pain Management
   1. If the procedure is performed on a conscious patient, immediately following placement of the IO needle, administer **0.5 mg/kg 2% Lidocaine (not to exceed 50 mg) *slowly*** through the IO site. Wait approximately 30–60 seconds before flushing with normal saline.
   2. In the event a patient regains consciousness and complains of severe pain secondary to the IO insertion, temporarily stop infusing the fluids, and administer lidocaine as in E.1 above. Wait approximately 30–60 seconds before continuing fluid administration.
   3. If fluids do not flow freely, flush IO site with an additional 10 cc normal saline.

PEDIATRIC EZ-IO™ PROCEDURE (patients weighing 3-39 kg)

A. Assemble all equipment. The EZ-IO PD® should be used on patients who weigh between 3-39 kg (approximately 6-87 lbs.)
B. Site Selection (Patients weighing 3-39 kg)
   1. Palpate the landmarks at the proximal tibia (patella and tibial tuberosity).
   2. Insertion site should be one finger width below the tibial tuberosity, then medial along the flat aspect of the tibia.
   3. If the tibial tuberosity cannot be identified on the child, then the insertion site may be two finger widths below the patella, then medial along the flat aspect of the tibia.

C. Needle Insertion
   1. Prep the surface with Betadine and wipe dry with a sterile gauze pad.
   2. Stabilize patient's leg and begin insertion from a 90-degree angle to the insertion site. Gently advance the needle set into position–do not force. Stop when you feel the "pop."
   3. When needle is in proper position, remove stylet (if insertion fails, leave the needle in place and clamp the EZ-Connect; do not attempt second insertion on same leg).
   4. Connect extension tubing or EZ-Connect, primed with saline, to IO hub.
   5. Confirm the catheter position (catheter is stable at a 90-degree angle to the bone, able to aspirate blood, and fluids flow without evidence of extravasation).
   6. Rapid bolus or "power" flush with approximately 5 ml normal saline when using the EZ-IO PD® needle.
   7. Connect IV tubing and bag to extension tubing or EZ-Connect.
   8. Consider additional bolus of saline if flow rates slower than expected.
   9. Utilize a blood pressure cuff or pressure bag to help infuse fluids.
   10. Dress site and secure tubing.

PEDIATRIC PROCEDURE WITH MANUAL IO DEVICE:

A. Assemble equipment
   1. Approved bone marrow needles, 15 or 18 gauge size
   2. Betadine® swabs
   3. Two small syringes (3-5cc)
   4. One large Luer-lock® syringe (35-50cc)
   5. Flush solution
   6. Sterile gauze pads and tape

B. Site Selection – Proximal tibia. Palpate the landmarks and note the entry point that is the anteriomedial flat surface 1-3 cm below the tibial tuberosity.

C. Prep the surface with Betadine® and wipe dry with a sterile gauze pad.

D. Needle Insertion
   1. Insert the needle at the proximal tibial site, directing the needle caudally. The needle should penetrate the skin and subcutaneous tissue and be pushed through the cortex of the bone using rotation (avoid rocking the needle) until a "pop" or loss of resistance is felt.
   2. Confirm placement of the needle by:
      a. Firm fixation of the needle and free aspiration of marrow/blood.
      b. Infusion of **2-3 cc of NS**, palpating for extravasation or noting significant resistance. If extravasation occurs, further attempts at the site should be avoided.
      c. It is not always possible to aspirate blood/marrow but the line may be patent.

E. Tape and secure IO needle firmly in place.

F. Start Infusion
   1. Although gravity drainage may suffice, pressurized infusions may be needed during resuscitation.
   2. When infusing medications via an IO route, pressure must be applied to the fluid bag in order to maintain flow rates. The EMT must continually monitor the rate of infusion.

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F.A.S.T. 1

A. If patient is conscious consider anesthetic.
B. Locate the appropriate site (midline of the manubrium). Clean and prep site.
C. Place the Target / Strain Relief Patch.
D. Place the infusion tube with the introducer.
E. Remove introducer leaving the infusion tube.
F. Aspirate with syringe to ensure proper placement.
G. Attach IV tubing and begin flowing solution.
H. Secure area with Protector Dome.
I. Attach remover to PT and transfer to receiving hospital.

CONTRAINDICATIONS TO IO:

A. Fracture of the selected bone.
B. Previous significant orthopedic injuries or procedures.
C. Infection at the site of insertion.
D. Excessive tissue at insertion site with the absence of landmarks.
E. Failed IO attempt of same bone.

NOTES & PRECAUTIONS:

A. Osteomyelitis, growth plate injury (in pediatric patients), and extravasation of fluid with compression of popliteal vessels or the tibial nerve may occur.
B. Airway and breathing should be established first in accordance with other protocols.
C. Do not perform more than one attempt in each tibia.
D. Any ALS medication may be administered IO.
E. Do not give Hypertonic Saline though an IO line.