

SIERRA-SACRAMENTO VALLEY EMS AGENCY PROGRAM POLICY

REFERENCE NO. 1101

SUBJECT: INTRAOSSEOUS INFUSION

PURPOSE:

To provide an alternative technique for establishing vascular access in critical adult and pediatric patients when peripheral IV access is difficult or time-sensitive.

AUTHORITY:

Health and Safety Code 1797.220 and 1798

California Code of Regulations, Title 22, Division 9, Section 100169

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.
- C. For adult and pediatric patients, weighing 3 kg or more, who present with one or more of the following clinical conditions:
 - 1. Cardiac arrest
 - 2. Hemodynamic instability (B/P <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 IN / IM anticonvulsants
 - 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 or too time consuming, resulting in a delay of life-saving fluids or drugs.

Effective Date: 06/01/2010

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Approved:

SIGNATURE ON FILE

S-SV EMS Medical Director

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CONTRAINDICATIONS:

- A. Fracture or suspected vascular compromise of the selected tibia or humerus.
- B. Previous significant orthopedic procedures (IO within 24 hours; prosthesis).
- C. Inability to locate anatomical landmarks for insertion.
- D. Skin infection overlying the area of insertion.

PROCEDURE FOR FDA APPROVED DRILL TYPE DEVICE:

A. Site selection and Preparation

- 1. In small children (3-12 kg), the tibial tuberosity cannot be palpated as a landmark, so the insertion site is two finger-breadths below the patella in the flat aspect of the medial tibia.
- 2. In larger children (13-39 kg) the insertion site is located on the flat aspect of the medial tibia one finger-breadth below the level of the tibial tuberosity. If the tibial tuberosity is not palpable, insert two finger-breadths below the patella in the flat aspect of the medial tibia.
- 3. For adults, proximal or distal tibial sites are preferred. If unavailable, the humeral site may be utilized as a site of last resort by providers who choose to approve their paramedic personnel to access this optional site:
 - a. The proximal tibial site is one finger-breadth medial to the tibial tuberosity.
 - b. The distal tibial site is two finger-breadths above the medial malleolus (inner aspect of ankle) in the midline of the shaft of the tibia.
 - c. Humeral insertion site is considered a site of last resort and may only be utilized by paramedic personnel who are adequately trained and approved by their provider to access this site (Intraosseous Infusion – Optional Humeral Site, Reference No. 1101-A)
- 4. Prep the surface with a recognized antiseptic agent and wipe dry with a sterile gauze pad.

B. Needle selection:

- 1. The EZ IO needle set is supplied in three sizes. All sets are 15 gauge needles but length is different for each.
 - a. PD needle is 15 mm long and usually used for patient less than 39 Kg.
 - b. AD needle is 25 mm long and usually used for patients greater than 39 Kg.
 - c. LD needle is 45 mm long and may be necessary for those patients with excessive tissue over the insertion site.

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2. Decisions for the correct length of needle should be based on a visual assessment of the insertion site and an estimation done by palpation. If the 5 mm mark is not visible when the needle is initially inserted with the tip resting against the bone, a larger needle must be used.

C. Equipment Assembly:

1. Inspect needle cartridge for damage and sterility. Verify seal is intact on needle cartridge.
2. Open cartridge and attach driver to needle set. Leave cap on until ready to insert.
3. Prime EZ-Connect with saline for unresponsive patients or lidocaine 2% for conscious patients.
4. Attach 10 ml syringe with normal saline to EZ-Connect.

D. Insertion Procedure:

1. Remove the needle tip cover insuring that you do not separate the needle from the stylet.
2. Stabilize the patient's extremity and be cautious of movement.
3. Insert the needle set through the skin at a 90 degree angle to the bone until the needle tip rests against the bone.
4. Confirm that the 5 mm mark is visible above the skin before powering the driver on. If the 5 mm mark cannot be visualized, select a longer needle set and begin again at step 1.
5. Depress the trigger and insert the needle into the bone. When you feel a lack of resistance or "pop" you have successfully penetrated the cortex and cannulated the medullary space.
6. While stabilizing the hub, remove driver by pulling straight back
7. Remove stylet from catheter by rotating the stylet counter-clockwise. Place stylet in approved sharps container.
8. Syringe flush catheter with 10 ml of normal saline. Remember, No Flush = No Flow. If the patient responds to painful stimuli, SLOWLY (over 1 to 2 minutes) administer 0.5 mg/kg of 2% Lidocaine (not to exceed 50 mg) prior to saline flush. 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.

PROCEDURE FOR MANUAL IO DEVICE (PEDIATRIC ONLY):

A. Equipment:

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1. Approved bone marrow type needles, 15 and 18 gauge size
 2. Recognized antiseptic agent
 3. Two 5 cc syringes
 4. 60 cc Leur-lock syringe
 5. Three-way stopcock
 6. Flush solution
 7. Sterile gauze pads and tape
- B. Site selection:
1. Proximal tibia
- C. Site preparation:
1. Palpate the landmarks and note the entry point that is the anteromedial flat surface 1 -3 cm below the tibial tuberosity. Then prep the surface with a recognized antiseptic agent and dry with a sterile gauze pad.
- D. Insert needle:
1. Insert 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. Placement in the marrow should then be confirmed by:
 - a. Firm fixation of the needle and either removal of the stylet with free aspiration of marrow/blood or:
 - b. Infusion of 2-3 cc of sterile solution, palpating for extravasation or noting significant resistance. If extravasation should occur, further attempts at the site and extremity should be avoided.
 - c. Note: it is not always possible to aspirate, but the line may be working.
- E. Tape and secure the IO needle firmly in place.
- F. Start Infusion:
1. Syringe flush catheter with 10 ml of normal saline. Remember, No Flush = No Flow. If the patient responds to painful stimuli, SLOWLY (over 1 to 2 minutes) administer 0.5 mg/kg of 2% Lidocaine (not to exceed 50 mg) prior to saline flush. Consider additional bolus of saline if flow rates slower than expected.

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2. Although gravity drainage may suffice, pressurized infusions (using 3-way stopcock and 60 cc syringe or infusion pump) may be needed during resuscitation.
3. When infusing medication via IO route, pressure must be applied to the fluid bag in order to maintain flow rates; the Paramedic must continually monitor the rate of the infusion.

PRECAUTIONS AND POSSIBLE COMPLICATIONS:

- A. Airway and breathing should be established first in accordance with other protocols.
- B. No more than one attempt in each tibia or humerus.
- C. Local infiltration of fluids / drugs into the subcutaneous tissue due to improper needle placement.
- D. Cessation of the infusion due to clotting in the needle, or the bevel of the needle being lodged against the posterior cortex.
- E. Osteomyelitis or sepsis
- F. Fluid overload
- G. Fat or bone emboli
- H. Fracture