Adult Intraosseous Infusion

Pre-Lab Packet

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Introduction

Intraosseous access, initially described in the 1940s, provides a safe and reliable method for rapidly achieving a route for administration of drugs, fluids, and blood products into a noncollapsible marrow venous plexus during resuscitation.[1, 2, 3] While mainly a technique employed in the setting of pediatric resuscitation, the IO route has recently been reintroduced as a safe and effective technique for venous access in critically ill or injured adult patients.[4, 5] Onset of action and drug levels following intraosseous infusion during CPR are comparable to those achieved following intravenous administration, and levels similar to those achieved after central venous administration have been documented in pediatric arrest models.[6] However, flow rates for volume resuscitation have been variable and the efficacy of the IO route for trauma resuscitation remains unproven.

Indications

There are no absolute indications for adult intraosseous infusion, simply because several options for venous access usually exist, including peripheral, external jugular, femoral, and central venous access. However, there are several situations when more preferred access techniques are problematic and adult intraosseous access may be appropriate .

1. Hypovolemic shock with peripheral venous collapse.
2. Intravenous drug users whose peripheral veins are thrombosed and obliterated.
3. Cardiac arrest without IV or ET access routes for medications.
4. Morbidly obese patients without alternative access routes.
5. Burn patients with massive escharification.
6. Cancer patients undergoing chemotherapy whose veins have become sclerosed.

Although intraosseous access may provide an alternative route for intravenous access in these problematic patients, it is virtually never the preferred method.

Contraindications

Percutaneous alternatives should be exhausted or contraindicated prior to contemplating intraosseous access. Although there are no absolute contraindications, relative contraindications include:

1. Cellulitis at the cannulation site.
2. Impaired wound healing.
3. Injury to the vessel proximal to the access site.
4. Fractures of the extremity in which the IO needle will be placed
5. Situations in which the time required to perform the technique (usually 5-6 minutes) will inappropriately delay treatment.
6. Pediatric patients (bone injection gun only)

Complications

1. Local hematoma.
2. Infection
3. Sepsis
4. Phlebitis
5. Embolization
6. Injury to associated structures.
7. Deterioration of an unstable patient during a time-consuming placement attempt.
8. Osteomyelitis

Anatomy

Detailed knowledge of anatomy is critically important to the success of this procedure. site. The recommended injection site is the proximal tibia, 1-2 cm medially and 1 cm proximal to the tibial tuberosity (Fig 1).

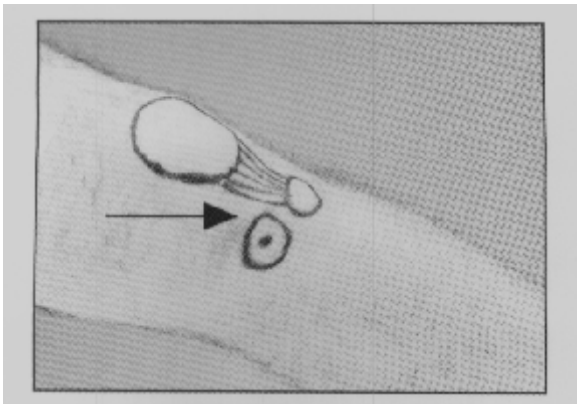

Figure 1. Landmarks for IO insertion

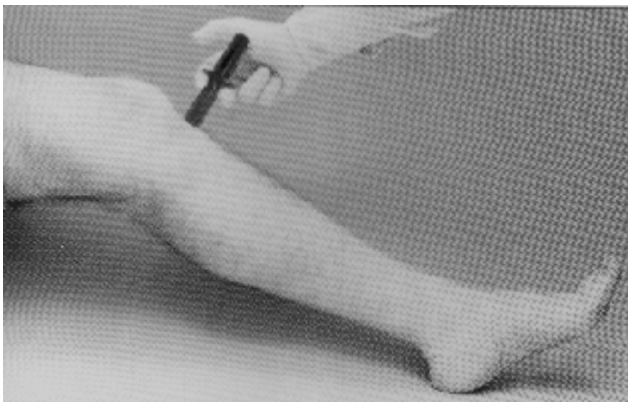

Figure 2. Position for injection.

Technique

1. Prepare the site for injection with aseptic technique.
2. Place in position, holding and pushing firmly on the front part of the bone injection gun in a perpendicular direction to the site of injection. Note the correct position of the device; the sharp points on the flange of the device should not be felt on your fingertips and the black arrows should point away from you (figure 2).
3. Pull out the safety latch from the instrument by squeezing its two sides together (figure 3).
4. Trigger by pressing the rear part of the housing against the two shoulders-handles of the housing.

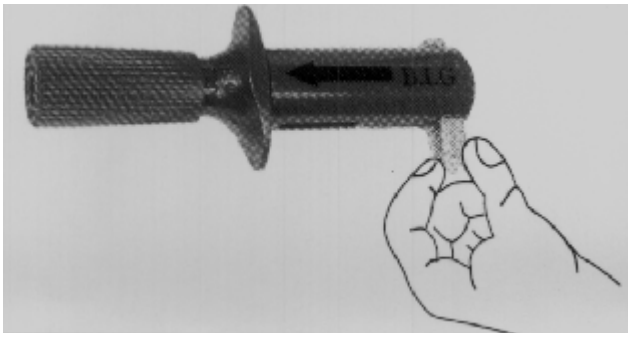

Figure 3. Remove the safety latch.

5. To remove the housing, hold it loosely and separate it from the needle by lightly twisting it.
6. Remove the needle trocar stylet by stabilizing the needle cannula and pulling the tip of the stylet. If the stylet is not easily removed, place the device ssafetylatch component around the tip of the stylet. Hold the ends of the latch to get a firm grip on the stylet. Twist and pull the latch to remove the stylet.
7. Connect a standard syringe to the needle cannula. Cap the needle between connections and disconnections of the set to prevent air infiltration through the open needle.
8. Confirm intramedullary needle tip position by:
   a. Aspiration of bone marrow
   b. Test injection of sterile saline
   c. Flee-flow infusion through the needle with no evidence of subcutaneous extravasation.
9. Connect intravenous fluids and verify flow.
10. Stabilize needle in position with bulky dressing.
11. Firmly tape the IV tubing in place.
12. Set proper IV flow rate.

Adult Intraosseous Access Skill Sheet	Possible Points	Points Awarded
Checks selected IV fluid for proper fluid, clarity and expiration date.	3	
Sets up equipment and prepares infusion set.	3	
Uses body substance isolation precautions.	2	
Identifies proper anatomical site for injection.	4	
Prepares site with antiseptic solution.	3	
Verbalizes contraindications (alternative routes available, pediatric, skin infection, fracture, compromised extremity, burns).	4	
Properly Inserts IO needle -Properly holds the bone injection gun. (1 point) -Places in position. (2 points) -Directs away from joint space. (2 points) -Triggers the device. (1 point) -Removes housing. (1 point) -Removes stylet. (1 point)	8	
Properly disposes of stylet.	1	
Confirms Placement -Verifies rigid position of needle. (1 point) -Connects syringe to needle and verifies intramedullary position by aspirating blood (2 points) -Attaches syringe and infuses 10 cc of fluid, observing for extravasation (2 points)	5	
Connects IV tubing and verifies patency of infusion.	1	
Connects pressure infuser bag at 300 mm Hg.	2	
Places antibiotic ointment over IV puncture site.	1	
Stabilizes needle with bulky dressing.	1	
Securely tapes IV tubing in place.	1	
Immobilizes leg to prevent line displacement.	1	
TOTAL SCORE	40	

Critical Criteria

_____ Failure to establish a patent infusion within 6 minutes.
_____ Directs needle toward joint space.
_____ Failure to take body substance isolation precautions prior to making incision.
_____ Contaminates equipment or site without appropriately correcting the situation.
_____ Any improper technique resulting in the potential for air embolism or infection.
_____ Failure to assure correct needle placement before attaching administration set.
_____ Failure to dispose of sharps in proper container.
_____ Failure to properly dress the site.

Bibliography

1. Heinild, S, Sondergaard, T, and Tudvad, F: Bone marrow infusions in childhood: Experiences from 1000 infusions. J Pediatr, 1947, 30:400-412.
2. Meola, F: Bone marrow infusions as a routine procedure in children. J Pediatr,1944,25:13-16.
3. American Heart Association: Pediatric Advanced Life Support, 1994.
4. Iserson, K: Intraosseous infusions in adults. J of Emer Med, 1989, 7:587-591.
5. Waisman, M and Waisman, D: Bone marrow infusion in adults. J of Trauma, 1997, 42(2):288-293.
6. Andropoulos, D, Soifer, S, and Schreiber, M: Plasma epinephrine concentrations after intraosseous and central venous injection during cardiopulmonary resuscitation in the lamb. J of Peditr, 1990, 6:330-332.