

MILITARY APPLICATIONS FOR INTRAOSSEOUS ACCESS

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Borron SW, Arias JC, Bauer CR, Philbeck T, et al. Intraosseous line placement for antidote injection by first responders and receivers wearing personal protective equipment. *American Journal of Emergency Medicine*. Doi:10.1016/j.ajem.2009.10.009.

Describes an animal trial that assessed the ability of protected, experienced first responders and limited-experience first receivers to place IO lines for antidote administration using the Vidacare EZ-IO device. First responders placed IO lines successfully in 100% of cases, and first receivers placed IO lines successfully in 91% of the cases. Investigators concluded that IO lines may facilitate earlier administration of antidotes to hazardous material victims.

Plancade D, Ruttimann M, Boulland P, et al. Evaluation d'un nouveau catheter pour perfusion intra-osseuse en OPEX. *La Revue du CARUM-Réanoxyo* 2009;25:49-50. [French]

Describes an observational study performed by the French military air surgical team in Chad. There were 11 patients with no insertion failures. For 7 patients, the insertion site was the proximal tibia and for the remainder the site was the proximal humerus. The authors concluded that the EZ-IO is a device that is simple, reliable and which gives satisfaction for the administration of drugs.

Sarkar D, Philbeck T. The use of multiple intraosseous catheters in combat casualty resuscitation. *Mil Med* 2009;174:106-8.

Describes a case report of multiple IO catheters for fluid resuscitation in a 19-year old soldier.

Wright JK, Christy RJ, Tharp RV, Kalns JE. Evaluation of intraosseous delivery of factor VIIa during hemorrhagic shock in the pig. *Mil Med* 2009;174:119-23.

Preclinical study demonstrating that IO can be used to infuse recombinant human factor VIIa during hemorrhagic shock.

Cooper BR, Mahoney PF, Hodgetts TJ, Mellor A. Intra-osseous access (EZIO®) for resuscitation: UK military combat experience. *JR Army Med Corps* 2008;153:314-6.

Describes the experience of the UK Defence Medical Service using the EZ-IO for emergency vascular access in Afghanistan. They used the device for 26 patients, including 10 children. Of the 26 EZ-IO placements, 23 were made in the emergency department. There was a 97% insertion success rate with no infection. Significant infusion pain was felt by three patients.

Suyama J, Knutsen CC, Northington WE, et al. IO versus IV access while wearing personal protective equipment in a HazMat scenario. *Prehosp Emerg Care* 2007;11:467-72.

Describes a controlled study comparing time difference between IV and IO access, while providers and simulated patients (mannequins) were wearing personal protective equipment (PPE), was compared. 22 EMT-P providers measured the times to skin access, vascular access and fluid infusion in three scenarios: no PPE for providers or mannequins; providers only in PPE; and both providers and mannequins in PPE. In all scenarios, there was a statistically significant difference in vascular access and fluid infusion time, in favor of the EZ-IO. Article concludes that the EZ-IO provides vascular access and fluid more quickly than standard IV access, and that donning PPE does not hinder providers' use of the EZ-IO.

Butler FK, Holcomb JB. The Tactical Combat Casualty Care Transition Initiative. *Army Medical Department Journal* PB 8-0504/5/6 Apr/May/June 2005:33-37.

Describes strategies employed as part of the Tactical Combat Casualty Care Transition Initiative, including phased levels of battlefield care, more aggressive use of tourniquets, battlefield antibiotics, IV vs IM battlefield analgesia, hypotension resuscitation strategies, small volume colloid as a resuscitation fluid, cricothyrotomy vs intubation for a definite airway in maxillofacial trauma, and more aggressive use of needle decompression for suspected tension pneumothoraces. Advocates IO infusion devices over cutdowns for fluid replacement.

Timboe HL, Bruttig SP, Ruemmler MW. Adult IO in the combat zone: the past, present and future use of intraosseous infusion by the U.S. military. *JEMS* 2005;30:27-8.

Describes an article discussing the use of IO in the combat zone. Highlights newer medical devices that make IO access and infusion safer.

Vardi A, Berkenstadt H, Levin I, Bentencur A, Ziv A. Intraosseous vascular access in the treatment of chemical warfare casualties assessed by advanced simulation: proposed alteration of treatment protocol. *Anesth Analg* 2004;98:1753-8.

Describes an evaluation of the B.I.G. in a chemical warfare mass casualty scenario. Found 73.4% simulated survival in the IO group and 3.3% in the control group (no IO). Average treatment goals obtained in 3.5 minutes for IO group and > 10 minutes for control group. Concludes that IO has great potential for early treatment of chemical exposure.

Walls RM. Adult intraosseous device aids terrorism response. *Anesth Analg* 2004;98:1753-8.

Describes an evaluation of the B.I.G. in a simulated mass casualty attack with 88.9% of IO attempts successful.
<http://emergency-medicine.jwatch.org/content/vol2004/issue728/>

Gawande A. Casualties of war-military care for the wounded from Iraq and Afghanistan. *NEJM* 2004;351:2471-5.

Describes the military medical system's strategies and systems of battle care.

Holcomb JB. Fluid resuscitation in modern combat casualty care: lessons learned from Somalia. *J Trauma* 2003;54:S46-51.

Describes a historical perspective on combat casualty care, differences in combat and civilian trauma cases, hypotensive resuscitation and hemorrhage control. Recommends instituting an algorithm for fluid resuscitation in combat casualties.

Ben-Abraham R, Gur I, Vater Y, Weinbroum AA. Intraosseous emergency access by physicians wearing full protective gear. *Acad Emerg Med* 2003;10:1407-10.

Describes a study evaluating the ability of physicians to establish IO access in patients while wearing full protective gear. Concludes that IO insertion of the B.I.G. needle is rapid, but the protective gear increased insertion time 50%.

Dubick MA, Atkins JL. Small-volume fluid resuscitation for the far-forward combat environment: current concepts. *J Trauma* 2003;54:S43-5. Review.

Describes a review article asserting that IO administration of hypertonic saline dextran is consistent with the concept of permissive hypotension. Calls for innovative techniques in resuscitating patients from severe hemorrhage.

Berkenstadt H, Ziv A, Barsuk D, Levine I, Cohen A, Vardi A. The use of advanced simulation in the training of anesthesiologists to treat chemical warfare casualties. *Anesth Analg* 2003;96:1739-42.

Describes the development of a simulation-based training program for anesthesiologists for treatment of nerve gas intoxication in mass casualty scenarios. As part of the program, the Bone Injection Gun was used for vascular access for delivery of fluids and medications. Most participants (22 of 25) concluded that the training program was an effective means to prepare for nerve gas intoxication in mass casualty situations.

Dubick MA, Holcomb JB. A review of intraosseous vascular access: current status and military application. *Mil Med* 2000;165:552-9. Review.

Describes a literature review of safety and efficacy of IO infusion of drugs and fluids, with emphasis on utility for the injured soldier. Discusses insertion times and flow rates. Includes literature citations from non-military studies in pediatrics, animals, and human cadavers.

Turkel H. Emergency infusion through the bone. *Military Medicine* 1984;149:349-50.

Describes an article for military medicine audience concluding that the intraosseous route is more safe and effective than the intravenous route for several clinical indications, including burns and shock, circulatory collapse, uncooperative patients, patients in transit, shortage of physicians, especially under emergency conditions. States that IO infusion is an established alternative to intravenous infusion.

A complete annotated bibliography and additional references are available by contacting Vidacare Corp. via Vidacare.com