

Brief report of EZ-IO

Request

TAU received an e-mail request from Gary Stoopler to assess EZ-IO on December 6, 2007. This brief report responds to this request.

Methods

A systematic literature search of articles in English was performed using Medline and Embase databases (search term: EZ-IO). We also consulted doctors/nurses in MUHC, and the sales representative in Quebec of Vidacare Corporation. Primarily, we examined the success rate of insertions and the average replacement time of EZ-IO. Furthermore, we explored the safety of using EZ-IO, specifically severe complications caused by the IO diffusion. Finally, we estimated the purchasing cost per procedure.

Results

The intrasosseous (IO) infusion is an injection directly into the marrow. Generally, IO is used when the vascular access cannot be achieved on time. The EZ-IO system has both battery-powered and manual devices. The powered drill of EZ-IO can easily penetrate the adult Tibia, so the IO access can be achieved at Proximal Tibia, Distal Tibia, Sternum, and Proximal Humerus.

Three studies of EZ-IO used in human beings were identified in Medline and Embase databases¹⁻³. All of them were observational studies in the emergency setting. Main results of those studies are summarized in table 1. The pooled estimate of the success insertion rate was 0.919 (95% confidence interval, 0.877 to 0.961). Gillum et al. study showed that the proportion of the good flow (>100mL) was 83%, the poor flow (<100mL) was 10%, and no flow was 7%¹. In addition, success insertion rates of EZ-IO reported in an unpublished paper and abstracts of conferences were even higher. Due to discrepancies of measurement methods, IO placement times were not comparable in those three studies. Generally, the infusion access by EZ-IO was faster than any other access technique, such as IV and F.A.S.T.1.(another IO device)^{1, 3}. One out of three studies did not observe any complications caused by EZ-IO¹, and the other two papers did not report complication events^{2, 3}. A review of IO infusions stated that IO access is very safe because severe complications rarely occur⁴.

Table 1: Main results of EZ-IO studies

Study	Condition	Age	Sample size	Success insertion rate	Good flow rate	IO placement time	Severe Complications
Gillum et al. 2005 ¹	IV fail	61	125	94%	83%	5 minutes †	0
Guyette et al. 2006 ²	No IV @	N	18	94%	N	315 seconds ‡	N
Frascone et al. 2007§ ³	IV fail	55	89	87%	N	60 seconds #	N

IV: Intravenous ; N: Not reported.

§: The EZ-IO devices in that study were donated by Vidacare, Inc.

@: No IV attempt before the IO placement.

†: The EZ-IO catheter was placed within five minutes of arrival at a patient's side.

‡: The median time from the start of the scenario to IO placement was 315 seconds.

#: Estimated time to infusion: From the time pulling the device from package to the time fluid infused. 62 out of 82 patients are less than 60 seconds.

A variety of isotonic fluids and many medications can be administered through IO access⁴. Currently, no resuscitation medicines used in IO are contraindicated⁴. While, the IO access is only appropriate for the short-term use, and the maximum time recommended is 24 hours⁵.

The purchasing cost for the sterile needle (one time used, both adults and pediatric patients) of EZ-IO system is 130 CAD \$ per set. The price of the EZ-IO power driver guaranteeing 1,000 insertions is 395 CAD \$. Other optional parts in the EZ-IO system are also possible to be used, such as the EZ-connect. So, we estimated the overall purchasing cost for EZ-IO device is about 150 CAD \$ per procedure.

Recommendation

Although ideal evidence is insufficient presently, three studies show that EZ-IO diffusion is a fast, effective and safe procedure to deliver medications and fluids. But, an EZ-IO procedure leads to the additional cost of 150 CAD \$, and the IO infusion device must be switched within 24 hours. Therefore, EZ-IO can be used as a backup in case of failures of both IV access and the Central Venous Access. If an immediate vascular access is needed in some emergency settings, such as cardiac arrest, EZ-IO can be used directly because the IO access is faster than other techniques.

Reference List

- (1) Gillum L, Kovar J. Powered intraosseous access in the prehospital setting: MCHD EMS puts the EZ-IO to the test. *JEMS* 2005 October;30(10):suppl-5.
- (2) Guyette FX, Rittenberger JC, Platt T, Suffoletto B, Hostler D, Wang HE. Feasibility of basic emergency medical technicians to perform selected advanced life support interventions. *Prehosp Emerg Care* 2006 October;10(4):518-21.
- (3) Frascone RJ, Jensen JP, Kaye K, Salzman JG. Consecutive field trials using two different intraosseous devices. *Prehosp Emerg Care* 2007 April;11(2):164-71.
- (4) Buck ML, Wiggins BS, Sesler JM. Intraosseous drug administration in children and adults during cardiopulmonary resuscitation. *Annals of Pharmacotherapy* 2007 October;41(10):1679-86.
- (5) DeBoer S, Seaver M, Morissette C. Intraosseous infusion: not just for kids anymore. *Emerg Med Serv* 2005 March;34(3):54, 56-4, 63.