

Traditional Intraosseous Needle vs Spring-loaded Device in a Pediatric Swine Model

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ABSTRACT

Objective: The technique of intraosseous (IO) needle placement is a safe and rapid method of establishing vascular access during pediatric resuscitations. We compared first-trial success rates, times to placement, and user preferences between a traditional IO needle and a spring-loaded needle (SLN) device. We calculated the sensitivity and specificity (with 95% CI) of marrow aspiration for confirming needle placement.

Methods: We performed a prospective, randomized crossover experiment in which 25 emergency medicine residents consented to serve as volunteers in placing two IO needles in post-experimental swine (mass range 19.1 to 23.0 kg). One needle was the traditional style (Jamshidi, Baxter Healthcare Corporation, 15 G) and the other was an SLN needle device (B.I.G., Wais Medical LTD, 15 G). Needles were placed bilaterally at the tibial plateau. Both devices were present to a depth of 1.5 cm. The order of placement was randomly assigned. Timing was recorded from when the device was picked up to when the stylet was removed. Marrow aspiration was then attempted. Needle location was confirmed by direct visualization after sawing down on the bone and infusing methylene blue into the marrow cavity. Users were asked which device they preferred. Times were compared with Student's t-test, success rates with Fisher's exact test, with $\alpha = 0.05$. **Results:** The median time to placement was 13 (95% CI: 12-15) seconds for the IO, and 13 (95% CI: 11-14) for the SLN. There was no difference between placement times (Kaplan Meier estimator, $p = 0.07$). Success rates were 80.0% for the IO and 84.0% for the SLN. This difference was not statistically significant ($p = 0.17$). Sensitivity of marrow aspiration for proper placement was 17.1% and specificity was 100.0%. The SLN was preferred by 76.0% of users. **Conclusions:** The two devices did not differ in success rates or time to placement. The SLN was preferred by most users. Marrow aspiration is not a useful test.