Heart Rate Effects of Intraosseous Injections Using Slow and Fast Rates of Anesthetic Solution Deposition

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Received January 4, 2006; Accepted November 26, 2007.

Abstract

The authors, using a crossover design, randomly administered, in a single-blind manner, 3 primary intraosseous injections to 61 subjects using: the Wand local anesthetic system at a deposition rate of 45 seconds (fast injection); the Wand local anesthetic system at a deposition rate of 4 minutes and 45 seconds (slow injection); a conventional syringe injection at a deposition rate of 4 minutes and 45 seconds (slow injection), in 3 separate appointments spaced at least 3 weeks apart. A pulse oximeter measured heart rate (pulse). The results demonstrated the mean maximum heart rate was statistically higher with the fast intraosseous injection (average 21 to 28 beats/min increase) than either of the 2 slow intraosseous injections (average 10 to 12 beats/min increase). There was no statistically significant difference between the 2 slow injections. We concluded that an intraosseous injection of 1.4 mL of 2% lidocaine with 1 : 100,000 epinephrine with the Wand at a 45-second rate of anesthetic solution deposition resulted in a significantly higher heart rate when compared with a 4-minute and 45-second anesthetic solution deposition using either the Wand or traditional syringe.

Keywords: Intraosseous, Heart rate, Slow and fast injections

When used as a primary or supplemental technique, various authors have reported an increase in heart rate with the intraosseous injection of epinephrine- and levonordefrin-containing anesthetic solutions.1-6 The increase in heart rate has ranged from 8 to 32 beats/min. As demonstrated by a number of studies,1-6 the patient usually perceives the increase in heart rate.

In previous studies,1-5 the local anesthetic solution was administered intraosseously over a 1- to 2-minute period using a conventional syringe. The Wand/CompuDent local anesthetic system has been developed to deliver a controlled amount of anesthetic solution at a precise and controlled rate. The slow rate of anesthetic solution administration with the Wand takes 4 minutes and 45 seconds to deliver 1.4 mL of anesthetic solution.

Clinically, it would be advantageous to reduce or eliminate the increase in heart rate using epinephrine-containing solutions with the intraosseous injection. We propose that a slow rate of anesthetic solution deposition may potentially reduce the increase in heart rate. Therefore, the purpose of this prospective, randomized, single-blinded, crossover study was to compare the effect on heart rate of delivering an intraosseous injection of 1.4 mL of 2% lidocaine with 1 : 100,000 epinephrine using 2 rates and 2 methods of solution deposition.