1% LIDOCAINE INJECTION, EMLA CREAM, OR “NUMBY STUFF” FOR TOPICAL ANALGESIA ASSOCIATED WITH PERIPHERAL INTRAVENOUS CANNULATION

Introduction

The entire surgical experience can be stressful for most people. Patients fear the unknown, what the surgeon may find, and the anticipated pain.

The “Numby Stuff” system (Iomed, Inc, Salt Lake City, Utah) is a noninvasive, needle-free method of providing local anesthetic that was approved by the US Food and Drug Administration in 1995 for use on adult and pediatric patients. It uses iontophoretic technology to deliver the local anesthetic through the skin without a needle injection. The local anesthetic used by the Numby Stuff system is called lidocaine, which is the trade name for a combination of 2% lidocaine and 1:100,000 epinephrine. Iontophoresis uses a mild electrical current to deliver the ions of medication through the skin. If the current carries the same electrical charge as the medication, the two like charges will repel one another and drive the medication through the skin. Currently, Numby Stuff is used primarily in the pediatric population for peripheral IV cannulation. The one major advantage of Numby Stuff is that it only requires a 10-minute application time before it becomes effective.

The purpose of this study was to assess patients’ perception of pain associated with peripheral IV cannulation, using 3 methods of applying local anesthetics. A prospective, randomized, quasi-experimental study was conducted, using a convenience sample of men and women, ASA physical status I, II, or III, undergoing outpatient or same-day surgery. Group 1 received a subcutaneous injection of 1% lidocaine, group 2 received topical EMLA cream for 45 to 60 minutes, and group 3 received treatment with “Numby Stuff” for 40 mA minutes. After the intended analgesic treatment was complete, the patient was asked to rate the pain experienced during the skin-numbing process. An IV was then started using an 18-gauge IV catheter, and the patient again was asked to rate the amount of pain experienced with the catheter insertion. A visual analog scale was used as the tool of measurement for pain.

Results of the study showed that group 1 experienced a higher treatment pain score than either group 2 or group 3, while group 2 experienced a higher pain score when the IV was started than either group 1 or group 3. Of the 3 methods tested, results seem to indicate that the Numby Stuff system using iontophoresis is the superior method for decreasing the pain associated with peripheral IV cannulation, and application of the analgesic method does not cause significant pain.

Key words: EMLA cream, iontophoresis, lidocaine, pain score.
Henry Ford Hospital, Detroit, Mich. Adults 18 years or older who agreed to participate in the study and signed the consent form were included. Enrollment continued until the determined sample size was met.

Exclusion criteria for this study were as follows:
1. An allergy to amide local anesthetics, epinephrine, sulfites, or sensitivity to certain adhesive tapes.
2. Presence of a pacemaker or any other electrically sensitive support system.
3. Use of monoamine oxidase inhibitors or tricyclic antidepressants.
4. Rash or impaired skin integrity of the arms and hands at the intended IV insertion site.
5. Intravenous catheter insertion requiring more than one attempt.

After admission to the preoperative holding area, patients meeting the inclusion criteria were asked to participate in the study. After the patient signed the consent form agreeing to participate in the study, the practitioner assessed the patient, applied analgesia, and started all IVs. Both forearms and hands were assessed to ensure optimal IV placement and to ensure intact skin at the intended treatment site. After the optimal IV site was determined, the randomly assigned method of dermal analgesia was applied.

**Group 1:** A subcutaneous injection of 0.3 to 0.5 mL of 1% lidocaine at the intended IV insertion site was given using a tuberculin syringe.

**Group 2:** EMLA cream, 2.5 g, was applied at the intended insertion site and covered with an occlusive dressing for 45 to 60 minutes.

**Group 3:** 1 mL of Iontocaine was applied to the delivery electrode and placed over the intended insertion site, and the ground electrode was placed more than 4 inches away. The Phoresor (Iomed, Inc, Salt Lake City, Utah) unit was attached, and the patient received 40 mA minutes of treatment. A 40-mA-minute treatment usually requires 10 minutes of application time but may be delivered slower if discomfort is felt. If the amplitude of the delivery unit is lowered, the patient still will receive 40-mA minutes of treatment; it will just take longer, for example, 4 A current × 10 minutes = 40 mA, or 2 A × 20 minutes = 40 mA.

After the intended analgesic treatment was completed, the patient was shown a 10-cm line with anchors at each end representing a continuum of pain intensity. One end of the line was anchored with “no pain,” while the other end of the line was anchored with “pain as bad as it could possibly be.” The patient was asked to make a mark on the line indicating the amount of pain experienced during the analgesic treatment. Then an 18-gauge IV catheter was used to cannulate the peripheral vein. Following the insertion of the IV catheter, each patient again was shown an identical 10-cm line and asked to rate the pain experienced at the time of catheter insertion. The marks placed on the line by the patient then were assigned a number to indicate the amount of pain experienced. Assigned numbers were determined by measuring, in millimeters, from the left-hand mark (the no-pain anchor) to the mark indicated by patients as a representation of the pain felt.

The 2 pain scores (the score obtained following the analgesic treatment and the score obtained after the insertion of IV catheter) were compared among the 3 study groups using analysis of variance (ANOVA). If a statistically significant overall group difference was detected at the .05 significance level from the ANOVA result, the Tukey test was used to perform pairwise group comparisons.

### Results

The demographic data are given in Table 1. For categorical data such as sex, ASA physical status, and surgical history, no statistically significant differences were found for the 3 groups using the Fisher exact test. However, when using ANOVA to test for differences, statistical significance was detected for treatment pain and IV cannulation pain at the .05 significance level. The Tukey test was used to test for the

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*Data are given as number (percentage). Each group included 10 subjects.

†Fisher exact test.
location of the differences. It was determined that group 1 experienced a higher treatment pain score (15.6) than either group 3 (2.5) or group 2 (0.2), while group 2 experienced a higher IV cannulation pain score (22.3) than either group 1 (6.4) or group 2 (4.2) (Table 2).

Discussion

Of the 3 methods tested, the Numby Stuff system using iontophoresis was the superior method for decreasing the overall pain associated with peripheral IV cannulation. The present study seems to show that the Numby Stuff system does not cause substantial pain during application and offers a localized, dense block that decreases the pain of IV insertion.

Lidocaine, which is the current treatment of choice for the adult population at the study facility, effectively blocked the pain associated with insertion of the IV catheter. However, patients reported a significantly higher pain score for the administration of lidocaine than patients receiving EMLA or Numby Stuff. Because of the higher pain scores associated with a lidocaine injection, it is not the current method of choice for children.

Currently, the method of choice for children at the study facility is the topical application of EMLA cream. The major drawback to EMLA cream is the 45- to 60-minute time required for application for the full effects of the cream to be noted. Even after the required application time was met, the pain experienced during IV insertion was significantly higher than with the other 2 methods.

Future studies should evaluate the Numby Stuff system for children before IV insertion. Other areas that can be explored using the Numby Stuff system are procedures that require local infiltration anesthetics before insertion, such as arterial lines, epidural catheters, and central venous access.

REFERENCES


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