The Use of Topical Anesthesia During Intravenous Catheter Insertion in Adults: A Comparison of Pain Scores Using LMX-4 Versus Placebo

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Introduction: Intravenous (IV) catheter placement is an extremely common painful procedure performed in all ages and healthcare settings, more often than not without anesthetic, despite clear research and guidelines demonstrating their effectiveness. This study examined differences in pain scores following topical anesthetic and placebo application, in a sample of healthy adult volunteers experiencing IV catheterization.

Methods: During this prospective, placebo-controlled, double-blind study, 43 subjects were randomized to receive LMX-4 on one hand and hand cream on the other 30 minutes prior to IV catheterization. Paired t-tests were used to measure the difference in pain scores between hands. Pain scores were reported utilizing a visual analog scale (0-10 cm) immediately after each stick. As a control, the difficulty of the IV stick was rated on a 0-10 cm scale and recorded by the nurse who started the IV.

Results: The mean pain score and standard deviation reported for the LMX-4 hand was 3.2 (SD=2.25, range, 0-8.5 cm), while the placebo hand was 4.67 (SD=2.25, range, 0.25-10 mm). The mean paired difference between LMX-4 and placebo hands was -1.37 (95% CI; -2.2, -0.49); subjects receiving LMX-4 reported clinically as well as statistically significant pain reductions (t=-3.17, p=0.003). When adjusted for difficulty of stick, pain scores continued to remain lower in the LMX-4 hand.

Discussion: These findings suggest that the topical use of LMX-4 anesthetic cream is a viable option for reducing the pain associated with IV catheter insertion in adults.

Key words: Topical anesthesia; Pain scores; Adults

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According to the Centers for Disease Control and Prevention Vital and Health Statistics 2005 summary of ED visits, more than 19.4 million peripheral intravenous catheter (PIV) insertions and 30.28 million blood tests were performed in emergency departments across the United States.[1] Consistently throughout the literature, phlebotomy has been identified as one of the most common painful procedures performed by nurses in the hospital setting.[2-4] The use of topical and intradermal anesthetics have been found to decrease the pain associated with this procedure, especially in children.[2,5-14] While application of a topical anesthetic agent prior to PIV insertion in adults is not yet a standard of practice, there is a growing body of evidence demonstrating its effectiveness and patients' desire for its use prior to catheter insertion.[2,5,15] Potential barriers to using an anesthetic prior to PIV insertion in the emergency department include the following: delayed action of topical medication; impractical in a busy work environment;

increases difficulty of insertion; and the perception by some nurses that there truly is not an anesthetic benefit.[2,3,16,17]

In addition to the desire to provide a less painful experience for each patient, increased satisfaction is an important reason to improve pain management practices. Press Ganey Associates is the recognized industry leader in the field of quality and satisfaction measurement from the patient's perspective. The Press Ganey patient satisfaction survey for emergency departments, while not specifically addressing PIV procedural pain, does address comfort during blood draws, pain control, nursing response and sensitivity to pain, technical skill, and overall rating of nursing care.[18,19] Additionally, overall pain control has been ranked number 3 on the Press Ganey 2007 ED Pulse Report.[4,20] With increased attention nationwide placed on patient satisfaction in the emergency department, emergency nurses have an important opportunity to decrease pain associated with PIV insertion and make a positive impact on patient satisfaction.

Several topical anesthetics are available to decrease the procedural pain associated with PIV insertion; however, they are used more frequently with children, and limited data exist regarding their efficacy in adults. The efficacy and equianalgesic properties of specific topical anesthetics such as lidocaine-prilocaine cream (EMLA), Tetracaine 4% gel, S-Caine Patch, and LMX-4 (4 % liposomal lidocaine) are well documented in the pediatric literature.[3,6,9,10,12,13,20] While a few studies have demonstrated the effectiveness of intradermal lidocaine for PIV in adults, even fewer investigations studied the effectiveness of topical anesthesia, and to the best of our knowledge, no previous study has compared the efficacy of LMX-4 anesthetic cream versus placebo in the adult population.[2,3,5,15,21] The purpose of this study was to compare (1) the difference in pain scores in a sample of healthy adult ED staff volunteers who received topical application of LMX-4 cream on one hand and placebo cream on the other hand 30 minutes prior to intravenous catheter insertion, and (2) the perceived level of insertion difficulty (by PIV insertion nurse) between treatment groups.

Materials and Methods

A randomized, double-blind, placebo-controlled trial was conducted. The Institutional Review Board approved the study, and all subjects provided written informed consent prior to participation.

PARTICIPANTS

A convenience sample of healthy ED staff volunteer subjects was recruited for participation from the ED staff at a large urban academic medical center. Volunteer subjects were recruited via E-mail and flyers posted throughout the department and included nurses, physicians, residents, and administrative support staff. All subjects eligible and available during the recruitment period were eligible for participation. Data were collected during prescheduled, 3-hour periods. Exclusion criteria included: (1) allergy to lidocaine or (2) current known pregnancy.

PROCEDURE

Study and placebo cream

LMX-4 anesthetic cream was used as the study cream. LMX-4 (previously known as ELA-Max) contains 4% concentration of lidocaine and 1.5% concentration of benzyl alcohol as a preservative (Ferndale Laboratories, Mich).[22] LMX-4 contains lidocaine in a liposomal form, which acts to facilitate skin penetration in order to improve anesthetic onset and duration.[6,23] Other ingredients in LMX-4 anesthetic cream include vitamin E acetate, propylene glycol, polysorbate 80, hydrogenated soy lecithin, cholesterol, carbomer 940, and water.[22] Similar to the placebo cream, LMX-4 cream is commercially available and can be purchased without prescription. A hand cream identical in appearance to the study cream was used as the placebo. The placebo cream used was Neutrogena Norwegian Formula Hand Cream Treatment, fragrance free, manufactured by Neutrogena, which is owned by Johnson & Johnson Corporation (New Brunswick, NJ). Neutrogena Norwegian formula ingredients include water (purified), glycerin, stearyl alcohol, stearic acid, sodium stearyl sulfate, methylparaben, propylparaben, dilauryl thiodipropionate, and sodium sulfate.[24]

Enrollment

During each enrollment period, 3 different nurses were used to complete the study procedures; a consent nurse, a cream application nurse, and a catheter insertion nurse. A total of 5 different experienced ED nurses were used to insert the intravenous catheters during the entire study period. Participants, as well as the consent nurse and the catheter insertion nurse, were blinded to which hand was treated with placebo or LMX-4. The consent nurse obtained written informed consent and asked subjects to complete a brief questionnaire reporting age and gender prior to application of the study creams. The cream application nurse used a computer-generated randomization list to determine which hand to apply the study and placebo cream for each subject. The cream application nurse applied a 2-cm thick amount of placebo and LMX-4 creams to the dorsum of each subject's hand based on the corresponding identification number on the master randomization sheet. The cream was then covered with a Tegaderm