Intradermal bacteriostatic 0.9% sodium chloride containing the preservative benzyl alcohol compared with intradermal lidocaine hydrochloride 1% for attenuation of intravenous cannulation pain

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This study compared the efficacy of a common medication diluent, bacteriostatic 0.9% sodium chloride containing the preservative benzyl alcohol with lidocaine hydrochloride 1% as an intradermal pretreatment for the relief of pain associated with intravenous cannulation.

Forty adult presurgical patients requiring two large bore intravenous catheters were used. They served as their own controls. The inner aspect of one forearm received the usual pretreatment, lidocaine hydrochloride 1%, and the inner aspect of the opposite arm received intradermal pretreatment with bacteriostatic 0.9% sodium chloride with the preservative benzyl alcohol. Intravenous cannulation was accomplished on the first attempt, and pain reported with cannulation was rated using a visual analogue scale (VAS). A paired t test was used to compare differences in VAS scores with the pretreatment bacteriostatic 0.9% sodium chloride containing the preservative benzyl alcohol with the pretreatment lidocaine hydrochloride 1%. Analysis of the data revealed no significant difference in the report of perceived pain of intravenous cannulation based on the intradermal pretreatment. These findings suggest that intradermal bacteriostatic 0.9% sodium chloride containing the preservative benzyl alcohol is as effective as intradermal lidocaine hydrochloride 1% in the attenuation of intravenous cannulation pain.

Key words: Bacteriostatic saline, intradermal anesthesia, intravenous cannulation, lidocaine.

Introduction

Most adults undergoing anesthesia for surgery require the insertion of an intravenous catheter preoperatively for management of fluid and acid-base balance and pharmacological support during the perioperative period. The process of cannulation with an intravenous catheter can be painful. Studies suggest that less pain is reported when intravenous cannulation sites are pretreated with intradermal lidocaine hydrochloride 1% solution than when sites are not pretreated.

Lidocaine hydrochloride may not be readily available for use in areas outside of the operating room. Lidocaine hydrochloride also has been noted to cause pain on injection in the form of a burning or stinging sensation.

Although lidocaine hydrochloride is an amide local anesthetic generally associated with fewer hypersensitivity reactions, the multidose vials often used for intradermal pretreatment may contain the preservative, methylparaben. Structurally, methylparaben is related to the preservative para-aminobenzoic acid (found in ester local anesthetics). Para-aminobenzoic acid is associated with allergic reactions.
One option in pretreating intravenous cannulation sites is the widely available, bacteriostatic 0.9% sodium chloride that contains the preservative, benzyl alcohol. Benzyl alcohol has local anesthetic properties that have been noted in the literature from as early as 1918. Benzyl alcohol is an ester-type local anesthetic, but it differs structurally from other esters in that it is not related to the allergen, para-aminobenzoic acid. Untoward reactions with the use of intradermal bacteriostatic 0.9% sodium chloride containing the preservative benzyl alcohol seem to be rare in adults. Evidence suggests that there is less pain on initial injection with bacteriostatic saline than with any other local anesthetic used. Local anesthesia lasts 2 to 3 minutes.

It was hypothesized that subjects would report no significant difference in perceived pain on a visual analogue scale (VAS) when bacteriostatic 0.9% sodium chloride containing the preservative benzyl alcohol was administered intradermally as a pretreatment over the intended cannulation site of the forearm compared with the intradermal administration of lidocaine hydrochloride 1% as a pretreatment at the same site on the opposite arm.

**Methods**

Approval for this study was obtained from the local review boards. Forty subjects gave written informed consent. The subjects were presurgical men and women who were 18 years or older and required two large-bore intravenous cannulation sites (Table 1).

Exclusion criteria included an inability to speak or understand the English language, preexisting pain, receipt of sedation or analgesia within 24 hours, allergy to amide local anesthetics, or a history of malignant hyperthermia or a neurological or psychological disorder. Also excluded were subjects in whom cannulation was not achieved on the first attempt.

Data collection occurred within the preoperative holding area of a large, suburban, 1,000-bed, tertiary care hospital. Privacy was provided for the subjects by the use of the available curtains around each cart.

The order of the treatment type, treatment site, and the treatment sequence was predetermined by using the patient's hospital identification number, which was randomized. Subjects served as their own controls. The investigator, who was blinded to the treatments used, pretreated and cannulated each intravenous site in the patient. Another investigator collected demographic data (Table 2) and administered a VAS after each IV was started.

![Table 2](https://via.placeholder.com/150)

**Table 2**

**Demographic and clinical data**

<table>
<thead>
<tr>
<th>Variable</th>
<th>n (%)</th>
<th>Mean</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Men</td>
<td>28 (70)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Women</td>
<td>12 (30)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age (years)</td>
<td></td>
<td>62.8</td>
<td>42-77</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td></td>
<td>78.8</td>
<td>53.1-191.2</td>
</tr>
<tr>
<td>Previous experience with intravenous cannulation</td>
<td>Yes 38 (95)</td>
<td>No 2 (5)</td>
<td></td>
</tr>
<tr>
<td>Gauge of intravenous catheter</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>24 (60)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>16 (40)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Treatment amount</td>
<td></td>
<td>0.27</td>
<td>0.1-0.4</td>
</tr>
<tr>
<td>Cannulation time (s)</td>
<td></td>
<td>12</td>
<td>5-30</td>
</tr>
</tbody>
</table>

The investigator who was blinded to the pretreatment type and sequence of administration performed both pretreatments and venous cannulation on the subject. The site selected on the inner aspect of the forearm was cleansed for 5 seconds with 70% isopropyl alcohol. Once dried, a pretreatment of not less than 0.1 mL and not more than 0.4 mL of lidocaine hydrochloride 1% solution or bacteriostatic 0.9% sodium chloride with the preservative benzyl alcohol was injected intradermally to cause a skin wheal, using a 25-gauge, 0.25-in needle, beveled-side up, attached to a tuberculin syringe. Cannulation techniques and location and intravenous catheter size were the same for both extremities in each subject.

Intradermal administration of lidocaine hydrochloride 1% at one site and bacteriostatic 0.9% sodium chloride at another site were the two levels of the independent variable manipulated. The dependent variable was the subject's quantified vertical slash mark to perceived pain using a VAS.

Visual analogue scales were developed more than 60 years ago and have been shown generally to correlate well in quantifying pain. A VAS is most often a line 10 cm long with numerical an-
Subjects are asked to place a vertical slash mark on the continuum at a point they feel quantifies the level of their pain. Data obtained from the VAS are ratio-level data. Markings were obtained after each successful cannulation at the treated site.

Data analysis was accomplished using the statistical system, SYSTAT version 5.04 for Windows for descriptive statistics, Pearson’s correlation, and the paired t test.

**Results**

There was no statistically significant difference in the report of perceived pain of intravenous cannulation when pretreatment with bacteriostatic 0.9% sodium chloride containing the preservative benzyl alcohol was used compared with the pretreatment lidocaine hydrochloride 1% (P = .239).

Pearson’s correlations were obtained on the variables of weight and the amount of pretreatment used; weight and reported pain; weight and time to cannulate; and amount of pretreatment and reported pain. There were no significant relationships noted between any of the variables.

**Discussion of findings**

The findings suggest that intradermal bacteriostatic 0.9% sodium chloride containing the preservative benzyl alcohol is as effective as intradermal lidocaine hydrochloride 1% in the attenuation of intravenous cannulation pain. Because of its minimal pain on injection, low toxicity, low allergy potential, low cost, and wide availability in multidose vials, bacteriostatic 0.9% sodium chloride containing the preservative benzyl alcohol may provide an equally effective, possibly safer alternative to lidocaine hydrochloride 1% for the attenuation of intravenous cannulation pain.

**REFERENCES**


**AUTHOR**

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