

Use and Effectiveness of Ethyl Chloride for Hand Injections

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Purpose Limited literature supports using ethyl chloride topical spray as an anesthetic for hand injections whereas documented risks include frostbite, skin irritation, and inhalation toxicity. We hypothesize that ethyl chloride spray imparts no benefit to patients' perception of pain or anxiety for routine hand injections.

Methods We first surveyed all members of the American Society for Surgery of the Hand to discern the prevalence of ethyl chloride use during routine injections. We then performed a prospective, randomized, study at 2 institutions evaluating the efficacy of ethyl chloride spray compared with "routine injection" (no topical spray) in patients indicated for a hand injection. All patients completed a pre- and postinjection 11-point questionnaire that inquired about various components of pain and anxiety.

Results A total of 2,083 (73% response rate) American Society for Surgery of the Hand members responded to the survey and revealed that 59% of hand surgeons always or often use ethyl chloride, and 24% never use it. There were no differences for region or practice setting, but experienced surgeons were less likely to routinely use ethyl chloride (35%) compared with younger surgeons (66%). Among 151 patients participating in the clinical study (75 with ethyl chloride), there were no differences for any outcome measure assessed. Injection pain in the spray and no-spray groups, pain after 1 minute, and overall anxiety were equivalent. Subgroup analysis demonstrated no effect of sex, anticipated anxiety, or pain threshold.

Conclusions Ethyl chloride is widely used among hand surgeons but imparts no benefit for routine hand injections in the clinical setting. The potential risks and costs of ethyl chloride use may outweigh its benefits. (*J Hand Surg Am.* 2017;42(3):175–181. Copyright © 2017 by the American Society for Surgery of the Hand. All rights reserved.)

Type of study/level of evidence Therapeutic II.

Key words Ethyl chloride, vapocoolant, injections, trigger finger, carpal tunnel.

 Additional Material
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THE USE OF TOPICAL, VAPOCOOLANT analgesia prior to routine hand injections is a common practice owing to a perceived reduction in pain and anxiety in the patient. However, limited evidence exists to support the use of a common vapocoolant spray for intravenous catheter placement^{1–4} and intradermal injections,^{5,6} and no studies have evaluated its efficacy for use in routine musculoskeletal injections. Nevertheless, we have recognized the

widespread use and perception that vapocoolant spray is preferred by patients and providers alike when administering corticosteroid injections in the hand. Based on our personal experience both using and not using this spray prior to injections, we questioned its efficacy.

Despite ubiquitous use, vapocoolant spray has limited literature support that has never been specifically examined for routine hand injections. In addition, its use may have associated risks. One study found that ethyl chloride is not superior to ice prior to intradermal injections,⁵ whereas other studies have reported a moderate effect, greater than controls but less than lidocaine.¹ Importantly, most prior studies have focused on pediatric patients prior to intravenous cannulation, but none have addressed musculoskeletal injections in adults. In addition, although rare, side effects of its use and misuse include frostbite, contact dermatitis, inhalation intoxication, and death.^{7–9} Some authors have also identified potential skin sterility concerns when using a spray solution prior to injection.¹⁰

Based on our personal observations and conflicting findings in the literature, we conducted a 2-part study to address the following question: What is the current use and effectiveness of ethyl chloride spray for routine hand injections? To address this question, our study included a national e-mail–based survey of hand surgeons in the United States regarding ethyl chloride use and a prospective, randomized, study examining patient perception of pain and anxiety before and after routine hand injections with and without the use of ethyl chloride spray.

METHODOLOGY

This study was performed after obtaining institutional review board approval. The study was divided into 2 parts: a national e-mail–based survey and a prospective clinical study.

E-Mail survey

An e-mail–based survey was performed to evaluate the use of ethyl chloride spray prior to routine hand injections among hand surgeons in the United States. Contact information for hand surgeons was obtained through membership records of the American Society for Surgery of the Hand (ASSH). All members were then sent an identical e-mail asking a single question with 5 answer choices. The question and answers were as follows: “In your hand practice, how often do you use Ethyl Chloride spray for analgesic effects immediately before a steroid injection (trigger finger, DeQuervain, carpal tunnel, joint injections)?” with

responses as follows: Always (> 90%), Often (67%–90%), Sometimes (33%–66%), Rarely (10%–32%), Never (< 10%).

Responses were collected over a 2-week period with interval reminder e-mails sent to nonrespondents. Once all survey responses were collected, we analyzed the distribution of responses as it related to years of ASSH membership (by decade), region of practice in the United States (U.S. Census defined: West, Midwest, South, Northeast), type of practice (academic or private with or without university affiliation), and specialty (orthopedic, plastic, or general surgery) as denoted in their ASSH membership records.

Clinical study

A prospective, randomized, study was performed to evaluate pain perception and anxiety experienced by patients before and after routine hand injections either with or without the use of ethyl chloride. Patients were invited to participate in the study only after meeting the indications for 1 of the following hand injections during a routine clinical evaluation: trigger finger, first dorsal compartment (DeQuervain tenosynovitis), carpal tunnel syndrome, and first carpometacarpal joint osteoarthritis. Exclusion criteria included patients who specifically requested ethyl chloride prior to an injection or could not complete an English survey. Informed consent was performed in all cases, and patients were then randomized to either receive or not receive ethyl chloride spray prior to their planned injection based on the calendar month (eg, no-spray in January, spray in February).

Procedure: The procedure was performed similarly for all patients at the 2 separate health care institutions participating in the study. Patients were positioned for comfort as per the attending surgeon’s usual routine. The skin was aseptically prepared with alcohol swabs prior to injection. For patients randomized to receive a vapocoolant spray, the injection area was then bathed in ethyl chloride spray (Gebauer’s Company, Cleveland, OH) for approximately 7 to 10 seconds, followed immediately by the injection. All injections were performed with a 27-gauge needle and the injection technique between the spray and the no-spray groups was consistent based on the surgeon’s practice. In all cases, the injected substance was a 1:1 combination of 1% plain lidocaine and 4 mg/mL dexamethasone. Injection volumes were as follows: 1 mL for trigger finger, 2 mL for DeQuervain tenosynovitis, 2 mL for carpal

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