

Atomized Lidocaine as Topical Anesthesia for Nasogastric Tube Placement: A Randomized, Double-Blind, Placebo-Controlled Trial

From the Division of Emergency Medicine, University of Utah School of Medicine, Salt Lake City, UT.

Received for publication August 5, 1999. Revisions received September 27, 1999, and January 28, 2000. Accepted for publication February 22, 2000.

Presented at the Society for Academic Emergency Medicine annual meeting, Boston, MA, May 1999.

Dr. Wolfe is founder and president of the company (Wolfe Tory Medical, Murray, UT) that produces and markets the mucosal atomization device used in this study.

Wolfe Tory Medical supplied all devices used in this study and funded a finder's fee for patients entered.

Address for reprints: David E. Fosnocht, MD, 1150 Moran Building, 75 North Medical Drive, Salt Lake City, UT 84132; 801-581-2730, fax 801-585-6699; E-mail dfosnocht@aol.com.

Copyright © 2000 by the American College of Emergency Physicians.

0196-0644/2000/\$12.00 + 0

47/1/106988

doi:10.1067/mem.2000.106988

Timothy R. Wolfe, MD
David E. Fosnocht, MD
M. Scott Linscott, MD

Study objective: To evaluate the efficacy of topical atomized 4% lidocaine in reducing the pain associated with nasogastric tube (NGT) placement.

Methods: This prospective, randomized, double-blind, placebo-controlled trial was conducted in the emergency department of a university teaching hospital. Study participants were alert, hemodynamically stable adult patients requiring NGT placement for diagnostic or therapeutic purposes. Atomized 4% lidocaine or normal saline solution was administered in the nasopharynx and oropharynx before NGT placement. All patients also received topical 2% lidocaine jelly intranasally after atomization. The pain of NGT placement was measured using a standard 100-mm visual analog scale.

Results: A total of 40 patients were enrolled in the study, with 20 in the lidocaine group and 20 in the placebo group. Mean pain scores were 37.4 mm (95% confidence interval [CI] 25.4 to 49.4) for atomized lidocaine and 64.5 mm (95% CI 51.8 to 77.1) for placebo with a mean difference of 27.1 mm (95% CI 14.8 to 39.4), achieving both clinical and statistical significance.

Conclusion: Atomized nasopharyngeal and oropharyngeal 4% lidocaine results in clinically and statistically significant reductions in pain during NGT placement.

[Wolfe TR, Fosnocht DE, Linscott MS. Atomized lidocaine as topical anesthesia for nasogastric tube placement: a randomized, double-blind, placebo-controlled trial. *Ann Emerg Med.* May 2000;35:421-425.]

LIDOCAINE AND NASOGASTRIC TUBE PLACEMENT

Wolfe, Fosnocht & Linscott

INTRODUCTION

An extensive body of literature has documented the inadequate management of pain in the emergency department.¹⁻¹² Reasons cited for the suboptimal treatment of pain include poor recognition of significant pain by medical providers, lack of adequate treatment options, and lack of sufficient research into specific therapies.¹³ Nasogastric tube (NGT) placement is a common procedure in the ED, and among the most painful and uncomfortable procedures performed on awake patients.^{12,14-17} In fact, Singer et al¹² found NGT placement to be the most painful procedure in their ED population, both by patient and practitioner assessment. The pain experienced during NGT placement was more than abscess incision and drainage, fracture reduction, and urethral catheterization. Despite the painful nature of this procedure, NGT placement was routinely done without analgesia or topical anesthesia.¹² This study hypothesized that topical atomized 4% lidocaine would reduce the pain of NGT placement compared with placebo.

MATERIALS AND METHODS

A prospective, randomized, double-blind, placebo-controlled trial was conducted to assess the pain of NGT placement after the intranasal and oropharyngeal application of an atomized solution of 4% lidocaine or placebo (Figure). The university institutional review board approved the trial.

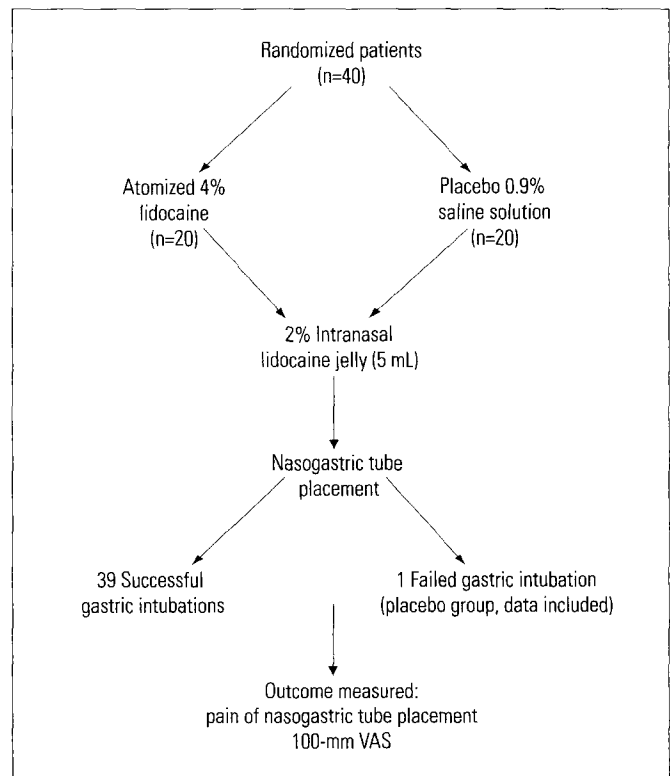
The trial was conducted in the ED of a university teaching hospital. A convenience sample of patients requiring NGT placement was enrolled in the study by experienced emergency nurses. Patients were eligible for enrollment if they were at least 18 years old and required the placement of an NGT in the ED. Exclusion criteria included inability to assess pain because of altered mental status or language barriers, hemodynamic instability, emergency indication for NGT placement such as major trauma or massive upper gastrointestinal hemorrhage, allergy to lidocaine or concurrent administration of a lidocaine drip, pregnancy, or weight less than 100 pounds (to reduce the potential for lidocaine toxicity).

The hospital pharmacy performed preparation and randomization of the study medication with no connection to the enrollment process or study participants. Study medication vials were randomized with a random number generator in lots of 10 to ensure timely use of prepared medication. The randomization code was maintained by the hospital pharmacy. Clear and colorless solu-

tions of 4% lidocaine or 0.9% normal saline solution were packaged identically and numbered consecutively for study use.

Emergency nurses were responsible for patient identification, consent, preprocedural education, NGT placement, and postprocedural data gathering. All nurses participating in data collection were experienced emergency nurses. Eligible patients were identified by their primary nurse and invited to participate in the trial. Written consent was obtained, and the use of the visual analog scale (VAS) was demonstrated to patients who agreed to be enrolled in the study. After informed consent was obtained, the next consecutively numbered vial of randomized study solution was obtained from the ED medication refrigerator. Then 1.5 mL of the study solution was atomized into the nasopharynx and 3 mL was atomized into the oropharynx and swallowed. Atomization was performed with a disposable mucosal atomization device. Immediately following atomization of the study medication, all patients in both study arms had 5 mL of 2% lidocaine jelly injected into the nostril selected for NGT

Figure.
Study profile.



placement and the nurse placed the NGT without delay. All NGTs were 18-F diameter Argyle brand tubes (Sherwood Medical, St. Louis, MO). NGT placement was confirmed clinically using auscultation, aspiration of gastric contents, and the ability of the patient to speak as combined indicators of successful gastric intubation. Patient, nursing staff, and physicians remained blinded to the nature of the study medication.

The total dosage of lidocaine for those receiving atomized 4% lidocaine and 2% lidocaine jelly was 280 mg. Total dosage of lidocaine for those receiving placebo and 2% lidocaine jelly was 100 mg.

Immediately after the NGT was secured, the patient was asked to rate the pain experienced during NGT placement by placing a mark on a previously validated 100-mm VAS.^{18,19} The VAS was a 10-cm unmarked horizontal line with the statement "least possible pain" at the left end, and "worst possible pain" at the right end. Patient VAS scores are reported as means with 95% confidence intervals (CIs) and compared by a Student's *t* test. Use of the parametric Student's *t* test has previously been validated for VAS pain score analysis.²⁰⁻²² Pain reduction of at least 13 mm was considered clinically significant.²³

RESULTS

A total of 40 patients were enrolled in the trial, with 20 patients randomly assigned to receive 4% lidocaine plus 2% lidocaine jelly and 20 patients assigned to receive 0.9% normal saline solution plus 2% lidocaine jelly. Sixteen nurses enrolled patients in the study, with a range of 1 to 4 patients entered per nurse. There were no significant differences in age and sex demographics between the 2 study groups (Table 1). Patients were more frequently entered in the afternoon and evening hours, likely because of the higher patient volumes during these times. There were no inadvertent tracheal intubations; however, NGT placement was unsuccessful in 1 patient. This failure occurred

Table 1.
Pretreatment characteristics.

Characteristic	All Patients (n=40)	Atomized Lidocaine Plus Lidocaine Jelly (n=20)	Atomized Saline Solution Plus Lidocaine Jelly (n=20)
Mean age, y (SD)	44.5 (19.1)	49 (19.2)	40.1 (18.4)
No. females (%)	60	65	55

in a 19-year-old woman with reported hematemesis. She received nasal saline solution placebo as the atomized solution. This patient scored her pain as 100 mm and refused further attempts at NGT placement. Her score was entered into the placebo group database.

A significant difference in pain scores was noted between patients in the lidocaine and placebo group. Mean pain scores were 37.4 mm (95% CI 25.4 to 49.4) for lidocaine and 64.5 mm (95% CI 51.8 to 77.1) for placebo, achieving both clinical and statistical significance with a mean difference of 27.1 mm (95% CI 14.8 to 39.4) (Table 2).

DISCUSSION

This study demonstrates that the pain of NGT placement can be significantly reduced by application of topical atomized 4% lidocaine immediately before insertion of the NGT. The clinical importance of this finding is emphasized in an article by Singer et al,¹² who demonstrated that NGT placement was not only the most painful procedure performed in their ED (even more painful than abscess drainage or fracture reduction), but also that this very painful procedure was infrequently pretreated with either analgesics or topical anesthetics.

Other authors have noted the ability of topical anesthetics to decrease the pain of NGT placement.²⁴ However, our study is the first to attempt to blind both patients and health care providers to the study drug. We administered 2% lidocaine jelly to all participating patients in an effort to reduce the patients' ability to distinguish between study drug and placebo. It should be emphasized that despite administration of lidocaine jelly to both study arms, atomized 4% lidocaine still significantly reduced the pain of NGT placement.

Singer and Konia²⁵ separately reported measurement of both pain and discomfort during NGT placement. Our attempts to distinguish between the pain and the discomfort

Table 2.
Outcome measures.

Measure	Atomized Lidocaine Plus Lidocaine Jelly (n=20)	Atomized Saline Solution Plus Lidocaine Jelly (n=20)	Difference (mm)
Pain, mean VAS score (mm)	37.4	64.5	27.1
95% CI	25.5-49.4	51.8-77.1	14.8-39.4

fort of NGT placement were met with confusion by both patients and staff and were abandoned. Any attempt to distinguish between pain and discomfort seemed to be arbitrary and limited by the definition of discomfort. Perhaps individual assessments of each individual adverse symptom experienced (gagging, nausea, vomiting, and so on) would have been better understood than the concept of "discomfort." Future studies should consider refining the measurement of "discomfort" in more detail, and validating a VAS for the more inexact definition of discomfort.

Singer and Konia²⁵ also suggest that topical anesthesia may lead to inadvertent tracheal placement of the NGT. Neither their study nor those of other investigators support this concern.^{24,26} In fact, Spector et al²⁶ found fewer incorrect NGT placements and complications with topical lidocaine than with placebo. The complication of incorrect tube placement should be easily recognized. The unproven theoretical risk of inadvertent tracheal placement should not dissuade ED personnel from using topical anesthetics to decrease the pain associated with NGT placement.

There are several limitations to this study. The primary limitation was the convenience sample of patients enrolled. The most common indication for NGT placement in our ED is for major trauma, and none of these patients were eligible for study entry because of their clinical condition. Only patients with gastrointestinal disorders were entered. Patient enrollment for this trial was nonconsecutive, depended on nurse identification of the patient and may be biased based on the perception of ED staff that certain patients were more suitable for enrollment than others. A second limitation may be the lack of any attempt to quantify the difficulty of NGT placement. However, NGT placement was unsuccessful in only one patient. This failure occurred in the placebo group. A third limitation was failure to quantify the success of blinding in this study. Every attempt was made to ensure blinding, including identical bottles for lidocaine and placebo and administration of topical lidocaine jelly to all participants in an attempt to cause some anesthetic effect even in the placebo arm. Future studies should consider postprocedural questioning to determine whether the patient or provider could ascertain into which study arm the patient was randomized. A fourth problem may be that the NGT was placed immediately after topical anesthetic spray and jelly were administered. This time was not measured but may have varied by a few minutes. In addition, no vasoconstrictors were used in this study. Although vasoconstrictors may be used intranasally to

reduce the incidence of epistaxis, these medications would not be expected to affect patients' sensation of pain. Finally, no attempt was made to standardize the entire method of NGT placement among practitioners. This may have led to variations in technique, causing increased pain when performed by certain practitioners. All nurses were trained to follow a set sequence (which was attached as a check list to every consent form) of medication administration and patient preparation before NGT placement, but the actual technique of placement was not predefined. This likely resulted in variations of technique among practitioners but is also likely to be representative of practice in most EDs. Ideally, a single individual would place all NGTs to reduce variation in technique, but because of the relative infrequency of nasogastric tube use in our nontrauma population, this was not practical.

In summary, the current study demonstrates that the pain of nasogastric tube placement can be significantly reduced by preapplication of topical atomized 4% lidocaine immediately before insertion of the NG tube. The application of atomized lidocaine should be considered in all patients who require nasogastric tube placement in an effort to reduce the pain of this procedure.

REFERENCES

1. Ducharme J. Emergency pain management: a Canadian Association of Emergency Physicians (CAEP) consensus document. *J Emerg Med.* 1994;12:855-866.
2. Ducharme J, Barber C. A prospective blinded study on emergency pain assessment and therapy. *J Emerg Med.* 1995;13:571-575.
3. Goodacre SW, Roden RK. A protocol to improve analgesia use in the accident and emergency department. *J Accid Emerg Med.* 1996;13:177-179.
4. Innes G, Murphy M, Nijssen-Jordan C, et al. Procedural sedation and analgesia in the emergency department. Canadian Consensus Guidelines. *J Emerg Med.* 1999;17:145-156.
5. Johnston CC, Gagnon AJ, Fullerton L, et al. One-week survey of pain intensity on admission to and discharge from the emergency department: a pilot study. *J Emerg Med.* 1998;16:377-382.
6. Jones JB. Assessment of pain management skills in emergency medicine residents: the role of a pain education program. *J Emerg Med.* 1999;17:349-354.
7. Lewis LM, Lasater LC, Brooks CB. Are emergency physicians too stingy with analgesics? *South Med J.* 1994;87:7-9.
8. Ngai B, Ducharme J. Documented use of analgesics in the emergency department and upon release of patients with extremity fractures [letter]. *Acad Emerg Med.* 1997;4:1176-1178.
9. Petrack EM, Christopher NC, Kriwinsky J. Pain management in the emergency department: patterns of analgesic utilization. *Pediatrics.* 1997;99:711-714.
10. Selbst SM, Clark M. Analgesic use in the emergency department. *Ann Emerg Med.* 1990;19:1010-1013.
11. Wilson JE, Pendleton JM. Oligoanalgesia in the emergency department. *Am J Emerg Med.* 1989;7:620-623.
12. Singer AJ, Richman PB, Kowalska A, et al. Comparison of patient and practitioner assessments of pain from commonly performed emergency department procedures. *Ann Emerg Med.* 1999;33:652-658.
13. Bonica J. Foreword. In: Paris PM, Stewart RD, ed. *Pain Management in Emergency Medicine.* West Hartford, CT: Appleton-Lange; 1987:xi-xii.

LIDOCAINE AND NASOGASTRIC TUBE PLACEMENT

Wolfe, Fosnocht & Linscott

-
14. Evans JC, Vogelponl DG, Bourguignen CM, et al. Pain behaviors in LBW infants accompany some "nonpainful" care giving procedures. *Neonat Netw.* 1997;16:33-40.
 15. Holden CE, MacDonald A, Ward M, et al. Psychological preparation for nasogastric feeding in children. *Br J Nurs.* 1997;6:376-385.
 16. Morrison R. Pain and discomfort associated with common hospital procedures. *J Pain Symp Man.* 1998;15:91-94.
 17. Tucker A, Lewis J. Procedures in practice. Passing a nasogastric tube. *BMJ.* 1980;281:1128-1129.
 18. Huskisson E. Visual analog scales. In: Melzack R, ed. *Pain Measurement and Assessment.* New York, NY: Raven Press; 1983:33-37.
 19. Wallenstein S. *Scaling Clinical Pain and Pain Relief.* New York, NY: Elsevier Science Publishers; 1984.
 20. Dexter F, Chestnut DH. Analysis of statistical tests to compare visual analog scale measurements among groups. *Anesthesiology.* 1995;82:896-902.
 21. Maxwell C. Sensitivity and accuracy of the visual analogue scale: a psycho-physical classroom experiment. *Br J Clin Pharmacol.* 1978;6:15-24.
 22. Revill SI, Robinson JO, Rosen M, et al. The reliability of a linear analogue for evaluating pain. *Anaesthesia.* 1976;31:1191-1198.
 23. Todd KH, Funk KG, Funk JP, et al. Clinical significance of reported changes in pain severity. *Ann Emerg Med.* 1996;27:485-489.
 24. Nott MR, Hughes JH. Topical anaesthesia for the insertion of nasogastric tubes. *Eur J Anaesthesiol.* 1995;12:287-290.
 25. Singer AJ, Konia N. Comparison of topical anesthetics and vasoconstrictors vs lubricants prior to nasogastric intubation: a randomized, controlled trial. *Acad Emerg Med.* 1999;6:184-190.
 26. Spector M, Kelly JJ, Dalsey WC, et al. Comparison of nebulized, sprayed lidocaine, and placebo as anesthesia for insertion of nasogastric tubes [abstract]. *Acad Emerg Med.* 1999;6:525-526.