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Anesthesia with topical lidocaine hydrochloride gauzes in acute traumatic wounds in triage, a pilot study

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ABSTRACT

Background: Topical application of lidocaine in wounds has been studied in combination with vasoconstrictive additives, but the effect without these additives is unknown. The objective was to examine use of lidocaine-soaked gauzes without vasoconstrictive agents, in traumatic wounds in adult patients, applied in triage.

Methods: A prospective pilot study was performed during 6 weeks in the Emergency Department of a level 1 trauma center. Wounds of consecutive adult patients were treated with a nursing protocol, consisting of lidocaine hydrochloride administration directly into the wound and leaving a lidocaine-soaked gauze, until wound treatment. Primary outcome was need for infiltration anesthesia. Secondary outcomes were Numerical Rating Scale (NRS) pain scores, adverse events and patient and physician satisfaction.

Results: Forty patients with a traumatic wound were included, 85% male with a wound on the arm. Thirty-seven patients needed a painful procedure as wound treatment. When suturing was necessary, 77% required additional infiltration anesthesia. Mean NRS pain scores decreased from 3.3 to 2.2 after application of the lidocaine gauze. No adverse events were recorded. Of the patients, 60% were satisfied with use of the lidocaine gauzes, compared to 40% of physicians.

Conclusion: Lidocaine hydrochloride (2%) gauzes without vasoconstrictive additives cannot replace infiltration anesthesia in traumatic wounds.

1. Introduction

Treatment of acute wounds in the Emergency Department can be painful for the patient as this can imply cleaning a wound using irrigation or wound closure with sutures or staples. Therefore, local anesthetics, particularly the amino-amides such as lidocaine or prilocaine, are frequently used to facilitate wound treatment (Giordano et al., 2015). These can be injected into the wound edges or used loco-regionally by infiltration. They can also be applied topically. The authors of a recent Cochrane Review concluded that topical anesthetics are possibly efficient in providing sufficient analgesia for skin suturing (Eidelman et al., 2011). However, most studies were done with commercially available combination preparations with a vasoconstrictive additive, for example lidocaine-adrenaline-tetracaine (LAT) or tetracaine-adrenaline-cocaine (TAC). Vasoconstriction probably enhances the duration and the intensity of topical anesthesia (Giordano et al., 2015; Yagiela, 1995). Where a wound is present, lidocaine should be absorbed quickly in absence of an intact skin barrier and the lidocaine soaked-gauzes without vasoconstrictive additives should be effective as well (Jenkins et al., 2014). However, there is no sound evidence whether this use of lidocaine hydrochloride is effective in providing analgesia and anesthesia to facilitate wound treatment.

The objective of the current study was to gather evidence whether adequate analgesia or anesthesia can be achieved by utilizing lidocaine hydrochloride (2%)-soaked gauzes without additional vasoconstrictive agents applied in triage in acute traumatic wounds in adult patients presenting to the Emergency Department.

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2. Methods

2.1. Study design

This was a prospective, observational cohort pilot study. Patients were included during a period of 6 weeks, from October 15th to December 1st 2014. Official approval of the Institutional Review Board (IRB) was not required as the Medical Research Involving Human Subjects Act (WMO) does not apply to the study (waiver nr W14_311#14.17.0374). The study conformed to the provisions of the Declaration of Helsinki. The study protocol was registered at the ISRCTN registry (registration nr 14408476). In reporting this study we adhered to the STROBE guidelines (Von Elm et al., 2007).

2.2. Study setting and population

All consecutive patients with an acute traumatic wound were included in the Emergency Department of a level 1 trauma center. The inclusion criteria were age 18–80 years with an acute traumatic wound and receiving analgesic treatment with lidocaine-soaked gauzes, as directed by an emergency nursing protocol. At the start of the study, this nursing protocol utilizing lidocaine hydrochloride-soaked gauzes was already in use for several months. Exclusion criteria were body weight <50 kg; a known allergy to local anesthetics; a clinical suspicion of nerve injury; and Manchester Triage System (MTS) category orange or red, requiring immediate treatment. An acute traumatic wound was defined as an injury causing any disruption in continuity of the skin and occurring less than eight hours before presentation to the Emergency Department. Patients with wounds in mucous membranes and wounds due to chemical or thermal injury were excluded.

2.3. Study protocol

After the patient's presentation with an acute wound, the emergency nurse in triage applied the lidocaine-soaked gauze according to protocol. This nursing protocol was defined as follows: a 5×5 centimeters (cm) sterile gauze was soaked in 5 milliliters (mL) lidocaine hydrochloride 2% (20 mg/mL) and some droplets of lidocaine 2% were administered into the wound (volume depended on wound size, but never exceeded 5 mL), before covering the wound with the gauze. The gauze was positioned in such a way that contact with the wound edges was maximized. The gauze was left in place for at least 20 minutes, or until the physician started surgical wound treatment. Wound treatment was defined as suturing, irrigation and/or wound dressing. Lidocaine 2% was used, as this was the highest concentration available in the department. Selection bias was minimized as all consecutive patients were included. Trained research assistants collected data during office hours and during all other hours patients were included by treating physicians and nurses. When eligible for inclusion in the study, pain was assessed before application and after removal of the gauze and measured using the 11-item NRS (Numerical Rating Scale) pain score, in which 0 means no pain and 10 is the worst pain imaginable. This pain score has been validated in the Emergency Department previously (Bijur et al., 2003). Before initiating wound treatment, anesthesia was carefully tested by pinching the wound edges with a small forceps. Additional infiltration anesthesia was administered by the treating physician when deemed necessary by patient or physician before or during the surgical procedure. This need for additional anesthesia was recorded in standard case-report forms. Other parameters that were documented were age; sex; wound size and localization; type of surgical wound treatment; duration of application of lidocaine-soaked gauzes; and the occurrence of adverse events, such as dizziness, tinnitus, blurred vision, convulsions, symptomatic arrhythmias and hypotension. Using a 5-point Likert scale, patient and physician satisfaction regarding pain treatment were recorded by asking the question "are you satisfied with this method of pain treatment [lidocaine gauzes]?".

2.4. Outcome measures

The primary outcome of the study was the need for additional (infiltration) anesthesia during wound treatment. Secondary outcomes were changes in NRS pain scores, occurrence of adverse events and patient and physician satisfaction regarding pain management.

2.5. Data analysis

The current study was designed as a pilot study, as no evidence regarding the use of lidocaine gauzes existed beforehand. In order to gather initial evidence and to demonstrate intervention efficacy in a single group, previous recommendations of a pilot study population of 20–40 patients were followed (Hertzog, 2008). We estimated that collecting patient data during a period of six weeks would yield this number of patients. Data were recorded and analyzed in a digital database, using IBM Statistics, version 22.0, Chicago. Data were recorded as absolute numbers with proportions, means with standard deviation, medians with percentiles and *p*-values, where appropriate. Normality of numerical variables was tested using histograms. Fisher's exact test was used for testing of categorical data and Student's *t* test or Mann–Whitney U test for continuous data. The homogeneity of variances was tested using Levene's test for equality of variances. In all tests, a *p*-value less than 0.05 was considered to indicate statistical significance.

3. Data/results

In total, 40 patients were included in the study. Demographics are shown in Table 1. Of these patients, 85% were male and had a wound on the upper extremity. Median wound size was 2.5 cm in length. Wound management consisted of a potentially painful intervention in 37 patients: suturing with or without wound irrigation in 32 patients and wound irrigation only in 5 patients. Wound dressing was applied without any intervention in 3 patients. Of all patients, 24 (62%) required additional infiltration anesthesia (Table 2). For patients who underwent a potentially painful wound intervention, this number was 67%. Patients treated with sutures required additional infiltration anesthesia in 77% and the 8 patients who were treated with irrigation or wound dressing only, did not require additional anesthesia. All face and neck wounds were additionally anesthetized, as were 70% of lower extremity and 55% of upper extremity wounds. Wounds requiring additional infiltration anesthesia were larger, with a mean wound length of 3.4 cm versus 2.0 cm. The

Table 1
Baseline characteristics of all patients.

Parameter	Total
Male sex	34 (85%)
Age (years)	40 (26.3–55.3)
Wound size (cm)	2.5 (1.5–3.5)
Wound localization	
Upper extremity	22 (55%)
Lower extremity	10 (25%)
Face and neck	6 (15%)
Scalp	2 (5%)
NRS pain score at baseline	3.3 ± 2.2
Wound treatment	
Sutures	32 (80%)
Irrigation, no sutures	5 (12.5%)
Wound dressing only	3 (7.5%)

Values are described as mean ± SD; median (Q1 to Q3) or n (%). Abbreviations: cm = centimeters; NRS = Numerical Rating Scale.