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ORIGINAL RESEARCH

Performance of Local Anesthesia with Lidocaine among Opium Addicts and Non-Addicts; a Case Control Study

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Abstract: **Introduction:**Compared to ordinary people, addicts usually have a lower pain threshold. The current work attempts to compare the performance of local analgesia with lidocaine among opium addicts and non-addicts. **Methods:**In this case-control study, opium addicts and healthy patients with skin laceration referring to emergency departments of two educational hospitals were compared regarding the response to local anesthesia with lidocaine, as well as side effects. **Results:** 197 cases with the mean age of 43.44 ± 20.12 years were studied (72.1% male). 98 (49.8%) cases were addicts and 99 (50.2%) were healthy people. Two groups were similar regarding age (p = 0.281), sex (p = 0.666), and wound size (p = 0.272). The amount of pain reduction 5 (df =1.5, F=0.38, p = 0.88) and 10 (df =1.5, F=0.58, p = 0.72) minutes after lidocaine injection was not different between the groups. Subgroup analysis based on sex and age of patient did not show any differences between the groups (p > 0.1 for all analysis). The mean duration of analgesia was 16.4 ± 5.37 minutes in addicts and 16.95±1.79 in control group (p = 0.334). **Conclusion:** Lidocaine, as a commonly used local anesthetic agents, does not show different effects in addicts and non-addicts in repairing skin laceration.

Keywords: Lidocaine; opium dependence; anesthetics, local; case-control studies; pain management

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1. Introduction

For decades, a new field of worry has been raised in surgery, which is about people who have drug dependence, especially in cases of intravenous drug use (1, 2). Acute pain would be partially relieved or not relieved at all among drug users (3). Compared to ordinary people, addicts usually have a lower pain threshold. Opium addicts have changes in function, sensitivity, reduction, and/or decreased number of opioid receptors systematically (4). This is why addicts are more resistant to analgesia and narcotics used (5-7). Studies have shown the fact that addicted people experience shorter anesthesia or sedation duration and depth when compared to non-addicts (7, 8). This fact has encouraged researchers to try to provide routes to use supplementary drugs in order to alleviate patients' pain throughout the procedures (4).The prevalence of addiction to narcotics was 2.26% in 2011, according to reports by the United Nations Office on Drugs and Crime (UNODC). Furthermore, Iran is in the second place of narcotic consumption, worldwide (available on: http://www.unodc.org).

The current work attempts to compare the performance of local analgesia with lidocaine among opium addicts and non-addicts regarding the rate of pain reduction and side effects.

2. Methods

2.1. Study design and setting

In this case-control study, patients with skin laceration who were referred to emergency departments of two hospitals affiliated to Shahid Beheshti University of Medical Sciences (Imam Hossein and Shohadaye Tajrish Hospitals) were enrolled. Addicted patients were compared with non-addicts in

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Table 1: Baseline characteristics of studied patients

Variables	Case (n=98)	Control (n= 99)	P
Sex			
Male	72 (73.5%)	70 (70.7%)	0.666
Female	26 (26.5%)	29 (29.3%)	
Age			
Mean ± SD	44.95±20.52	41.84±19.87	0.281
Wound size			
Mean ± SD	5.81±0.90	5.86±1.01	0.272
Systolic blood pressure (mmHg)			
Baseline	125.30±11.51	118.87±13.70	<0.001
30 min	122.86±9.82	118.74±8.20	<0.001
Diastolic blood pressure (mmHg)			
Baseline	80.46±5.52	87.08±72.40	0.863
30 minute	79.66±2.83	79.85±1.12	0.420
Pulse rate			
Baseline	81.45±8.49	79.70±5.40	0.321
30 minute	81.53±9.44	79.71±5.95	0.344
O_2 saturation			
Baseline	95.94±1.69	96.94±1.02	<0.001
30 minute	95.04±9.73	103.11±60.41	<0.001
Pain score			
Baseline	6.1±1.4	5.4±1.0	<0.001
5 minute	4.04±1.76	3.00±1.26	<0.001
10 minute	2.00±2.12	1.43±0.72	0.034
Duration of anesthesia			
Mean ± SD	16.40±5.38	16.96±1.80	0.003
Median (IQR)	16 (14-18)	17 (16-18)	

SD: standard deviation, IQR: Inter-quartile range.

terms of response to anesthesia with local lidocaine, as well as side effects. The participants gave their informed consents verbally and all the cases and included data were kept by the principal investigator to maintain patients' privacy. People were free to decide to stay in the study or leave in any step with no penalty.

2.2. Participants

Patients 15 years of age or older with laceration size of more than 5cm, were divided into two groups of addicts and non-addicts. People with any sensory or mental disorder who have limitations to reliably express their pain severity as well as cases with tendon injury or positive history of allergic reaction to lidocaine or cardiac problems were excluded.

Participants were defined as addict when they had used opioids daily for the last 6 months, and had shown withdrawal symptoms.

2.3. Data gathering

A checklist consisting of demographic data (age, sex), vital signs (blood pressure, respiratory rate, O_2 saturation) before and 30 minutes after local anesthesia, pain score at 0, 5, and 10 minutes after local anesthesia, as well as duration of anesthesia was filled for all case (addicts) and control (healthy) group members by a senior emergency medicine resident.

2.4. Procedure

Wounds underwent complete sterilization using sterile medical equipment and detergents. Local anesthesia was applied by injecting subcutaneous lidocaine 2% solution (maximum dose of 5 mg/kg) at the laceration site after asking the participants about their relevant medical background like any allergy to the medication or any cardiologic problems.

Using numeric rating scale (NRS), the pain severity of patients was recorded before and 5 and 10 minutes after injection of local lidocaine (the maximum dose of 5 mg/kg). NRS ranges between 0 and 10, where the former shows no pain, while a score of 10 shows the highest level of pain, which was not experienced by the patients.

2.5. Statistical Analysis

The data were entered to SPSS11 for windows, while quantitative variables were shown by mean ± standard deviation and qualitative ones were reported using frequency. Independent t-test was used to compare quantitative data, while Chi-square test was used for qualitative ones. Since systolic blood pressure (SBP), arterial O_2 saturation and pain score differed between the groups before lidocaine administration;

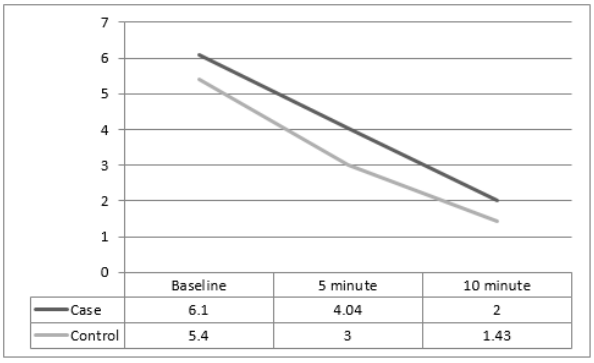

Figure 1: Comparing the trend of pain reduction 5 (p = 0.88) and 10 (p = 0.72) minutes after lidocaine injection between case and control groups.

analysis of covariance was used to compare the findings after intervention. Effects of age and sex on lidocaine efficacy were investigated via two-way ANOVA. P value <0.05 was considered as significance level.

3. Results

3.1. Baseline characteristics

197 cases with the mean age of 43.44 ± 20.12 (16-90) years were studied (72.1% male). 98 (49.8%) cases were addicts (case group) and 99 (50.2%) were healthy people (control group). Table 1 compares the baseline characteristics of studied groups. The two groups were similar regarding age (p = 0.281), sex (p = 0.666), and wound size (p = 0.272). Pain score at the time of admission was 6.1 ± 1.4 in addicts and 5.4 ± 1.0 in control group (P<0.001, clinically not important).

3.2. Pain management

Figure 1 compares the trend of pain reduction between the groups, 5 and 10 minutes after lidocaine injection. The rate of pain reduction 5 (df =1.5, F=0.38, p = 0.88) and 10 (df =1.5, F=0.58, p = 0.72) minutes after lidocaine injection was not different between groups. Subgroup analysis based on sex and age of patients did not show any differences between the groups regarding the trend of pain reduction after 5 and 10 minutes (p > 0.1 for all analyses).

The mean duration of analgesia was 16.4 ± 5.37 minutes in addicts and 16.95±1.79 minutes in control group (p = 0.334). Although differences of vital signs between groups 30 minutes after lidocaine injection were statistically significant, they were clinically important (table 1).

4. Discussion

The current study disclosed no difference in pain reduction rate among addict and non-addict participants after using lidocaine as an anesthetic agent for skin laceration. The duration of action was similar in case and control groups.

Through a study in Iran, which was done between 2010 and 2011, investigators found that in people with fractured lower limb, duration of anesthesia was shorter among opium addicts compared to non-addicts when spinal anesthesia was tried (4). They also believed that use of multiple medications or higher doses of anesthetics was required in drug users, mainly because of their absolute tolerance to the medication. Narcotics can influence numerous receptors in central and peripheral parts of nervous system (6, 9). These receptors would interrupt local anesthesia due to being interfered by opioids (10, 11).

The current study tried to match age and sex between case and control groups. However, previous studies have pointed out that age and body characteristics like weight and height usually have no impact on anesthesia onset and duration (4).

Regarding the changes in vital signs and O_2 saturation, there was not any clinically significant difference between the groups. Most adverse side effects of anesthetic medications are known to manifest in heart and nervous system. The first report of tonic effects of long-acting local anesthetics on heart and brain was provided by Albright (12).

In terms of cardiac adverse effects, plasma concentration of lidocaine with less than 5mg/ml dose has no toxicity on human heart. In higher serum levels, hypotension would be a cause of worry. Cardiac toxicity mainly results from cardiac sodium channel blockage and calcium and potassium ion channels are also affected, particularly in high doses of lidocaine and other similar drugs (13). Bradycardia in addition to hypotension, would lead the patient to hypoxia and hypercarbia, resulting in acidosis. Acidosis, in turn, could result in more toxicity by decreasing plasma protein binding of lidocaine (14, 15). These were the main events checked in the current study.

Maximum dose for local injection of lidocaine to be safe is 500-600 mg, which is equal to 7-8 mg/kg. In this study, we used 5mg/kg of the drug for both cases and controls to prevent any serious or permanent side effects.

This study evaluated the consequences of lidocaine administration, and it seems useful to carry out future researches, with a bigger sample size from different races, to achieve reliable findings in this regard.

5. Conclusion

It could be concluded that lidocaine, as a commonly used local anesthetic agent, does not show different effects in addicts and non-addicts in repairing the skin laceration.

6. Appendix

6.1. Acknowledgements

None.

6.2. Author contribution

All authors pass the four criteria for authorship contribution based on the International Committee of Medical Journal Editors (ICMJE) recommendations.

6.3. Funding/Support

None.

6.4. Conflict of interest

None.

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