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ORIGINAL RESEARCH

Comparison between effects of intravenous lidocaine and sublingual nifedipine on preventing blood pressure increase in laryngoscopy

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Introduction: Arrhythmia during surgery most frequently occurs during laryngoscopy and intratracheal intubation. Many surgical procedures require intratracheal intubation, which results in hemodynamic changes. These changes in ill patients and patients with limited coronary flow reserve are associated with serious events.

Materials and methods: A randomized clinical trial was performed on 124 healthy patients who were elective surgery candidates at Taleghani hospital in Kermanshah. Patients were allocated randomly to each equal group of 62 patients with 95% significance and 90% power of test-retest for sample size. The patients had no history of disease or use of special medications. Drugs commonly used for laryngoscopy and intubation to prevent hemodynamic complications, intravenous lidocaine and sublingual nifedipine, were compared with independent and paired *t*-tests.

Results: This comparison suggested that while the mean age, weight, and sex distribution in our two groups were the same, mean changes in systolic and diastolic blood pressure and heart rate increases in the lidocaine group were 12.6%, 7.5%, and 16.5%, and in the nifedipine group, 17.7%, 11.0%, and 23.5% (*P* value = 0.0052, 0.189, and 0.0001), respectively.

Conclusion: According to the results of our study, intravenous lidocaine is more effective than sublingual nifedipine for preventing hemodynamic changes while performing laryngoscopy or intratracheal intubation.

Keywords: hemodynamic changes, laryngoscopy

Introduction

Generally, 2 methods of general anesthesia and local anesthesia are used in surgical procedures. A general anesthesia step is performing laryngoscopy and intratracheal intubation after induction or anesthesia onset. This step is important because most hemodynamic changes occur at this stage. Blood pressure increase and tachycardia are the most common reactions, while bradycardia and hypotension are rare.[1]

Hemodynamic changes among patients with limited coronary reserve and/or myocardial ischemia have severe consequences, particularly in old people and people with vascular defects. Predicting the hemodynamic changes that may result in myocardial ischemia for patients undergoing laryngoscopy and tracheal intubation, will help to avoid events that trigger ischemia and allow immediate treatment.[2] These events are more common and more severe in very ill patients and among newborns but they are also suffered by young people.[3]

In treatment centers worldwide since 1986, a variety of reliable and suitable methods to prevent hemodynamic events such as slow and light induction and then

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administering drugs such as the β-blockers, lidocaine, fentanyl, or calcium-channel blockers have been tried. In our study, we compared the efficacy of intravenous lidocaine or sublingual nifedipine in preventing increase in blood pressure due to laryngoscopy. We conducted this study to find the preferred method in patients who undergo surgery with general anesthesia. In some other studies, a combination of two or more drugs were compared,[4] however, our study is effective because it is simple and compares lidocaine with nifedipine only.

Materials and methods

This randomized clinical trial study was carried out in Taleghani Hospital, Kermanshah, Iran. One hundred twenty-four patients aged under 40 years in American Society of Anesthesiologists (ASA) physical status classes I or II, with no systemic disease such as hypertension, ischemic heart disease (IHD) and brain vascular disease, underwent elective, noncardiac procedures. After approval by the Ethics committee and signing of the informed consent, patients were allocated randomly and equally to groups A and B with 95% level of significance and 90% power of test-retest in sample size calculation. With comparison two mean formulas [$n = (Z_{1-\alpha/2} + Z_{1-\beta})^2 (\delta_1^2 + \delta_2^2) / (\mu_1 - \mu_2)^2$]. No patient had a history of taking drugs such as β blockers and monoamine oxidase inhibitors (MAOI).

Group A was given 10 mg nifedipine capsules 10 min before anesthesia induction. Patients were asked to suck the pierced nifedipine capsule. Patients in group B received 1.5 μg/kg lidocaine 90 s before intubation. All patients in both groups received 1 μg/kg fentanyl as premedication 5 min before anesthesia induction. General anesthesia was induced with thiopentone 5 mg/kg after laryngoscopy. Intratracheal intubation was facilitated with suxamethonium 1.5 mg/kg. All patients were intubated by the same experienced anesthesiologist.

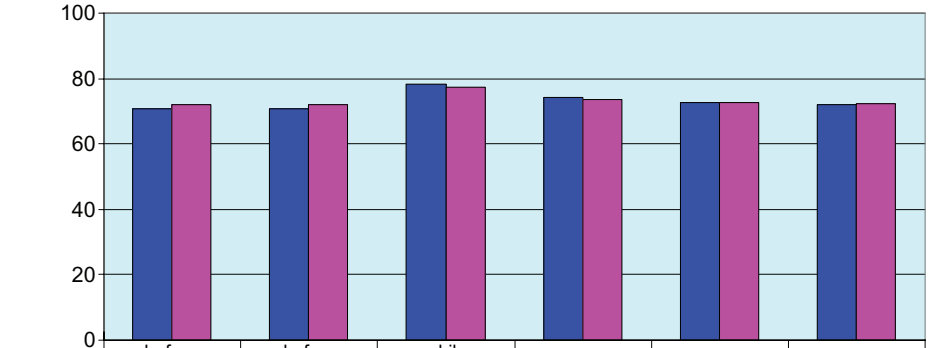
Systolic (SBP) and diastolic blood pressure (DBP) and the patients' pulse were measured by a noninvasive Passport 2 monitoring device (Datascope Corp, NJ, USA) before entering the operation room, before anesthesia induction, immediately after laryngoscopy and intratracheal intubation, and 1, 2, and 3 min after intubation.

Data were recorded in a form designed for this study and analyzed by SPSS software (vs 12.0; SPSS Inc., Chicago, IL). Also obtained were the mean of continuous variables such as blood pressure change, and age using Leven test (is a test to show variances), independent sample *t*-tests and distribution of discrete variables such as sex with chi-squared test compared in groups A and B. Continuous variables were compared with paired sample *t*-tests in both drugs.

Results

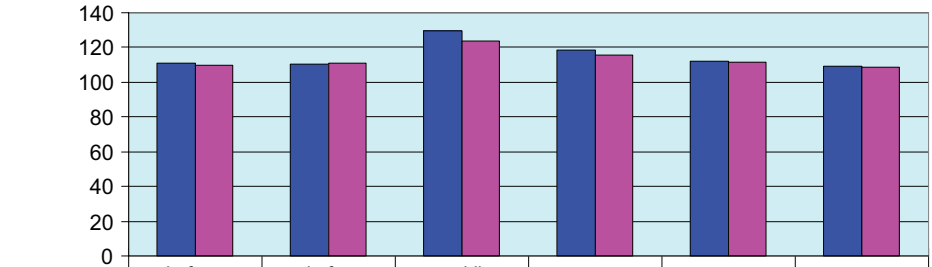
The mean age of patients in group A was 30.65 ± 8.33 years and in group B was 28.92 ± 8.45 years. The mean weight in the nifedipine group was 54.29 ± 12.35 kg and in the lidocaine group was 54.18 ± 12.65 kg ($P > 0.05$). The percent of females in group A were 56.5% (35 people) and in group B were 54.8% (34 people) ($P > 0.05$). These data suggested that although patients were divided randomly into two groups, there were no statistical differences between groups and both groups had the same condition.

The SBP and DBP in groups A (nifedipine group) and B (lidocaine group) during laryngoscopy and intubation were higher compared to SBP and DBP rates before induction in both groups. SBP and DBP changes at 1, 2, and 3 min after intubation were not statistically significant. Both groups had the highest rate during laryngoscopy. Patient heart rate (HR)



	before surgery	before induction	while intubation	1st min	2nd min	3rd min
Adalat	70.73	70.81	78.23	74.27	72.5	72.02
Lidocaine	72.1	72.1	77.26	73.55	72.66	72.41

Figure 1 Diastolic blood pressure mean in both groups.



	before surgery	before induction	while intubation	1st min	2nd min	3rd min
Adalat	110.76	110.65	129.6	118.5	111.94	109.35
Lidocaine	109.72	110.73	123.55	115.81	111.45	108.47

Figure 2 Systolic blood pressure mean in both groups.

in group A was higher than group B during laryngoscopy and intubation but HR changes at 1, 2, and 3 min after intubation were same in both groups.

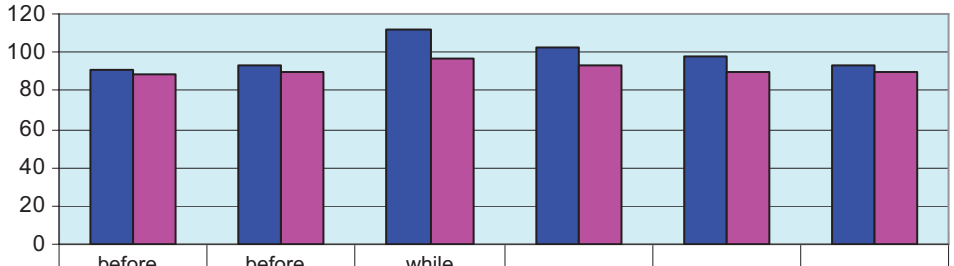
The increasing percentages of SBP, DBP and HR in intubation time according to before surgery were significant. SBP in A and B groups was 17.73 ± 8.38 and 12.58 ± 7.42 ($P = 0.0052$), DBP 10.97 ± 9.99 and 7.55 ± 9.67 ($P = 0.0189$) and 23.5 ± 13.04 and 16.46 ± 7.66 ($P = 0.0001$), respectively.

Discussion

Our study is unique because intravenous lidocaine and nifedipine have not been compared in any previously published study. However Puri and Batra in 1988 showed that administration of nifedipine 10 mg before induction, can reduce arterial pressure but not HR.[5] A later study by Inada and colleagues on the effects of lidocaine compared with labetalol on hemodynamic changes during laryngoscopy, showed that that there was no significant difference in hemodynamic changes.[6]

A study by Splinter showed that lidocaine does not attenuate hemodynamic responses beneficially during laryngoscopy and intubation,[7] but our study showed an opposite result because it compared two drugs. Miller and colleagues selected 45 ASA class I and II Chinese patients to study the effect of intravenous lidocaine in attenuating the cardiovascular response to laryngoscopy and intubation, but their study showed no significant difference between groups.[8] Kale and colleagues showed that nifedipine 10 mg is a useful pretreatment to prevent the pressor response to laryngoscopy and tracheal intubation in patients with coronary artery disease. However, our sample was a group of almost healthy patients and therefore was unable to confirm their hypothesis.[9] Ravussin and colleagues compared esmotol with lidocaine on preventing mean arterial pressure and intracranial pressure increase. They concluded that these drugs could not completely prevent mean arterial pressure and intracranial pressure increase during laryngoscopy and intubation.[10]

In 2000, Charuluxananan and colleagues compared the efficacy of nicardipine and lidocaine in attenuation of cardiovascular responses to endotracheal intubation. The



	before surgery	before induction	while intubation	1st min	2nd min	3rd min
Adalat	90.42	93.63	111.65	102.61	97.56	93.71
Lidocaine	88	89.19	97.08	93.39	89.63	89.16

Figure 3 Heart rate mean in both groups.

authors concluded nicardipine can be used as an alternative to lidocaine in attenuation of cardiovascular response to tracheal intubation in patients without ischemic heart disease.[11]

Conclusion

Our study suggested that, intravenous lidocaine is more effective than sublingual nifedipine for preventing hemodynamic changes while performing laryngoscopy or intratracheal intubation. And this is an important criterion for decreasing myocardial ischemia cases.

Disclosure

The authors report no conflicts of interest in this work. The study was approved by the ethical committee of Kermanshah University of Medical Science.

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