

Comparison between the Effects of Alfentanil, Lidocaine and Their Composition in Controlling the Hemodynamic Responses at the Time of Awake Extubation of Patients

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Abstract

Background and aim: Instability in the hemodynamic symptoms has been common at the time of extubation in patients and the cause to create the side effects. The aim of this research was to study the effect of injection of Alfentanil, Lidocaine and their composition in reduction of side effects arising from extubation. **Materials and methods:** 172 patients (20 - 40 years old) that referred to Shahid Rajaei Hospital in 2014 and had been under the orthopedic surgery, were divided randomly and by using colored cards into four equal groups (43 patients in each group). Alfentanil (5 microgram/kilogram) was injected to the first group. The second group received Lidocaine (1 milligram/kilogram). The composition of these two drugs was injected to the third group and the normal equal volume of Saline was injected to the fourth group which was the control group. The means of systolic and diastolic blood pressure, average arterial pressure and the number of heartbeat at the time of extubation were measured and registered 1, 5, 10, 15 and 20 minutes after extubation. Also, the amount of situation of bucking after extubation was registered in the groups. **Results:** The demographic results were similar in all groups. The mean of systolic blood pressure and number of heartbeats in the group of Alfentanil and composition of Alfentanil-Lidocaine had significant reduction ($p < 0.05$) in comparison with the control and Lidocaine group. The mean of diastolic blood pressure and average arterial pressure hadn't significant difference between the control group and other groups ($p > 0.05$). The situation of bucking in three treatment groups had significant reduction in comparison with control group. **Conclusion:** Alfentanil and composition of it with Lidocaine both had caused reducing the systolic blood pressure and heartbeats.

Keywords

Alfentanil, Lidocaine, Hemodynamic Responses

1. Introduction

Waking up from general anesthesia (emergence) and extubation are two important stages of anesthesia; because, numerous problems can occur at this time. Although, intubation has attracted much attention to itself especially when the airway has been affected by problem, extubation of patients hasn't been considered so much [1] [2] [3]. The anesthesia specialists know that a short time after extubation causes many incidents and the incidents like larynx spasm, aspiration, lack of complete openness of airway, insufficient pulmonary ventilation and severe coughs can occur that all cause emerging hypoxemia that this problem can cause emerging myocardial ischemia especially in the patients that are affected by the coronary arteries disease [4] [5].

Many techniques can cause reducing these harmful effects [6]. Narcotics, beta-adrenergic drugs and the blocker drugs of calcium canal have been studied vastly [7].

Lidocaine by competition with calcium in sitting on the neural membrane receptors causes controlling the passage of sodium from beyond the cellular membrane and the depolarization stage reduces the potential of the act [8]. These effects are started by revocable stabilization of neural cells membrane as the result of reduction of permeability of this membrane to the sodium ion and the conduction of the neural waves is stopped. In the event of absorption of many amounts of Lidocaine, it can have stimulator effect and then weakening effect on the central neural system [9] and [10].

The side effects of this drug include hands tremor, restlessness, ear buzz, sight darkness or diplopia that with much consumption, it also can cause reducing the heartbeat, spasm, cardiac arrest, asthma, respiratory arrest. Also, Lidocaine has caused reducing the activity of efferent C fibers of larynx and it causes suppressing the cough reflex and somehow it has succeeded in reducing the hemodynamic responses [11].

The narcotic drugs are usually used to reduce the side effects arising from extubation and among them, two drugs of Alfentanil and Remifentanil due to the start of quicker effect have been more common than other narcotic drugs in the recent years [12].

Therefore, the executors of plan intended to use of a method that has the least hemodynamic responses within and after extubation and also has a comparison between the effects of Lidocaine and Alfentanil in controlling the hemodynamic responses at the time of extubation.

2. Materials and Methods

This study was a randomized double-blind clinical trial which was done on 172

candidate patients for orthopedic surgery of upper organs in Shahid Rajaei hospital dependent on Medical Sciences University in 2014. This study was approved with ethics code of 29.281 and meantime acquiring the written testimonial from the patients eligible for entering to the study, they were ensured that had right to be dispensed with continuing the work with researchers group and the research units were also ensured that all information remains confidential. Determination of the number of needed sample for doing the current study was calculated according to the researches accomplished in this field and by considering the power of 80% and the first kind error of $\alpha = 0.05$.

The criteria for entering the patients to the study have included the age of 20 - 40 years old, weight of 60 - 80 kg and from two genders, the criteria for exiting from the study included existence of cardiovascular diseases, mental disease, spasm, glaucoma, numerous allergies, receipt of blood, blood products and addiction to the drugs. At first, the patients were monitored and then they received 0.03 mg/kg of Midazolam and 1 mcg/kg of Fentanyl, then they were inducted by 2 mg/kg of Propofol and 0.5 mg/kg of Atracurium and anesthesia was continued by receiving 100 mcg/kg Propofol, 50% of O₂ and 50% of N₂O. Then, the patients were divided into 4 groups (43 patients in each group) randomly and by using of colored cards that the Alfentanil (5 mcg/kg), Lidocaine (1 mcg/kg), simultaneous amount of Alfentanil-Lidocaine and normal saline (with equal volume of 6 ml) were injected in order to the patients of groups A, B, C and D. The vital symptoms of patients including systolic and diastolic blood pressure and the number of heartbeats, existence or lack of existence of bucking were controlled and registered in 1, 5, 10 and 15 minutes after prescription of these drugs till extubation of patient. Extubation was done when the patient followed the orders (opening the eyes) and after extubation, the vital symptoms of patient were controlled and registered with interval of 5 minutes (till 15 minutes). According to the provided checklist, the data have been collected; according to the SPSS software, they have been entered to the computer and the data analysis was done by using of t-test, ANOVA, repeated measure ANOVA.

3. Results

172 patients (20 - 40 years old) were divided into four groups randomly (43 patients in each group). The patients of four groups didn't have significant difference with each other in terms of the demographic information.

The patients of all four groups were compared with each other in terms of the mean of systolic and diastolic blood pressure and number of heartbeats that as it is observed in the **Figure 1**, the systolic blood pressure was compared at the times of before injection of drug and 1, 5, 10, 15 and 20 minutes after injection of drug in four groups. The mean of systolic blood pressure in Alfentanil group has less amount than other groups and it has higher amount in the witness group; and statistically, Manova test indicated significant difference between the groups ($p = 0.01$). The mean of systolic blood pressure and number of heartbeats in the group of Alfentanil and composition of Alfentanil-Lidocaine had significant reduction ($p < 0.05$) in comparison with the control and Lidocaine group.

Also, the mean of average arterial blood pressure was compared at the times of before injection of drug and 1, 5, 10, 15 and 20 minutes after injection of drug in four groups. MANOVA test indicated that there is no significant statistical difference between the groups and the mean of the average arterial blood pressure is similar in the samples of all four groups ($p = 0.21$) (**Figure 2**).

The diastolic blood pressure was compared at the times of before injection of drug and 1, 5, 10, 15 and 20 minutes after injection of drug in four groups. MANOVA test indicated that there is no significant statistical difference between the groups and the mean of diastolic blood pressure is similar in the samples of all four groups ($p = 0.09$) (**Figure 3**).

As it is observed in the **Figure 4**, the mean of the number of heartbeats was

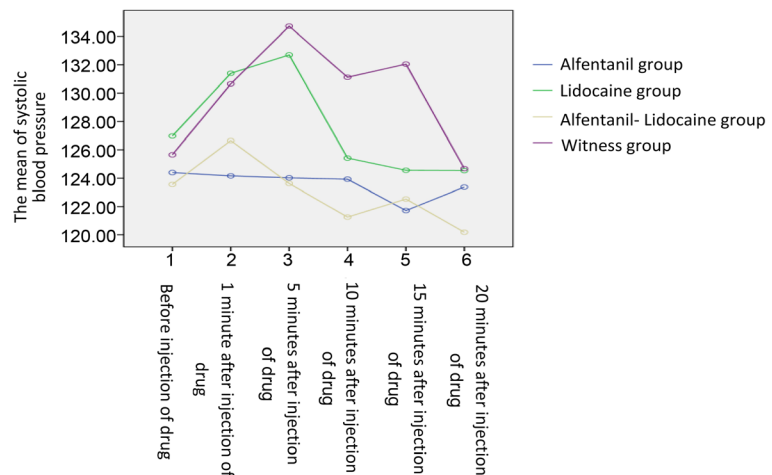


Figure 1. Comparison of the mean of systolic blood pressure in the specified times in four groups under study.

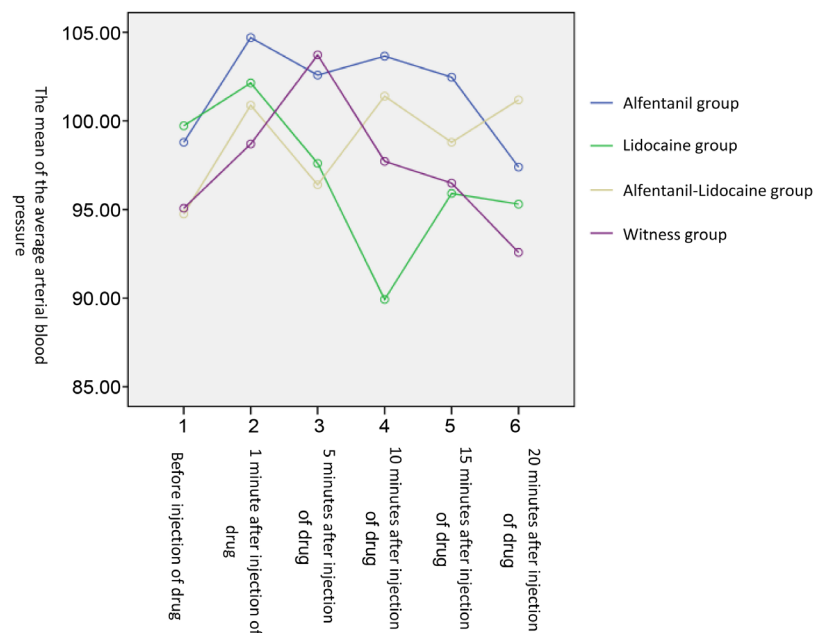


Figure 2. Comparison of the mean of average arterial blood pressure in the specified times in four groups under study.

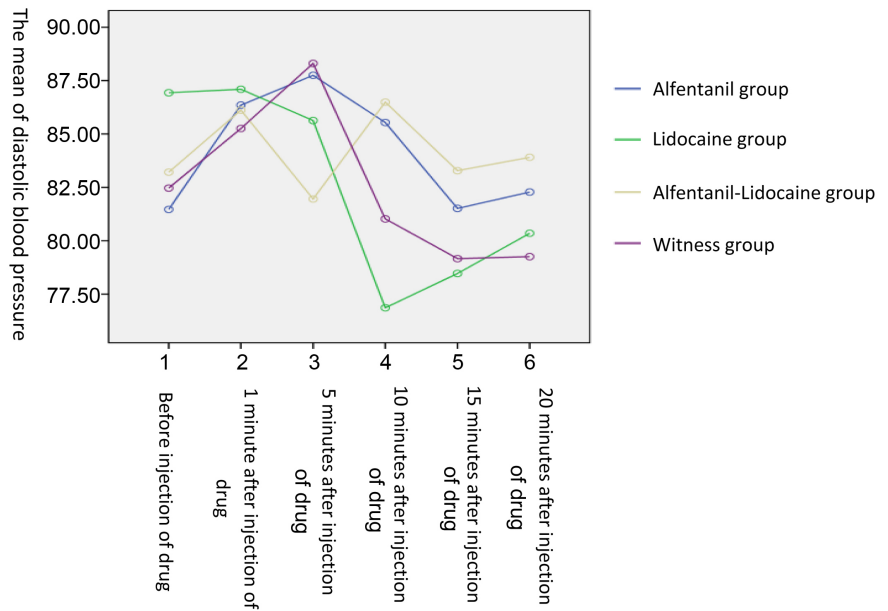


Figure 3. Comparison of the mean of diastolic blood pressure in the specified times in four groups under study.

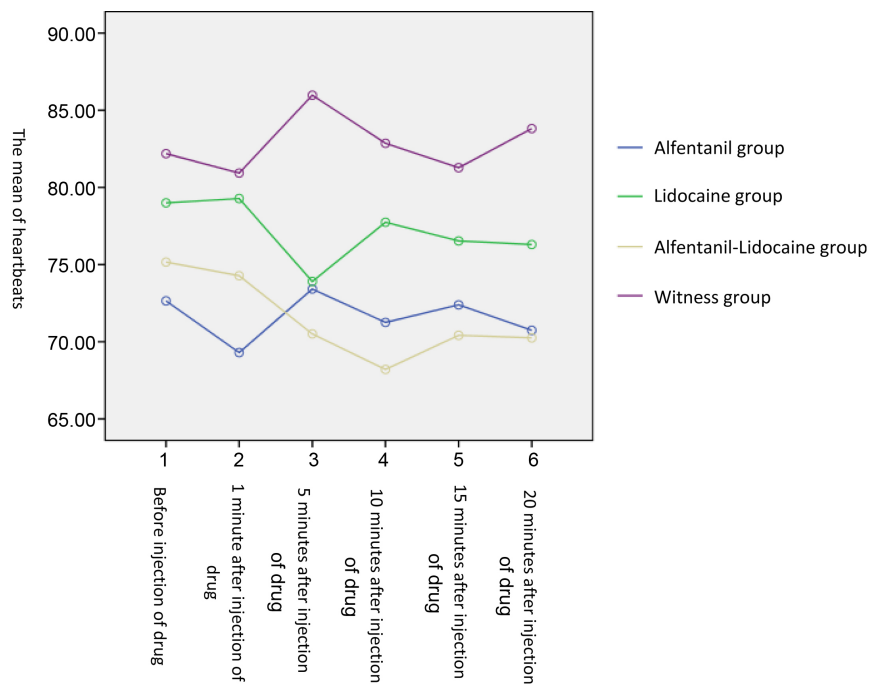


Figure 4. Comparison of the mean of the number of heartbeats in the specified times in four groups under study.

compared at the times of before injection of drug and 1, 5, 10, 15 and 20 minutes after injection of drug in four groups. As it has been indicated in this diagram, the mean of the number of heartbeats in two groups of Alfentanil and composition is in better range than two other groups and MANOVA test indicated that there is significant statistical difference between the groups.

The patients were controlled in terms of the tremor severity at the beginning

of entering to the recovery. All three treatment groups had significant reduction in emergence of tremor after surgery in comparison with other group in a manner that the most frequency was related to the witness group and the least frequency was related to the Lidocaine group; and Alfentanil and composition groups had equal frequency. The statistical test of Chi-square indicated that there is significant difference between the groups in terms of bucking frequency ($p = 0.001$) (**Table 1**).

4. Discussion

Generally, the results of study indicated that injection of Alfentanil and composition of two drugs of Alfentanil and Lidocaine caused good effect on systolic blood pressure and number of heartbeats; but, they hadn't any effect on diastolic blood pressure and average arterial pressure. Also, all three drugs caused to reduce the number of bucking cases after extubation. But, the mean of the time of drug injection till the time of extubation had become longer in injection of all three drugs.

Doing the extubation at the end of anesthesia can cause to create a series of hemodynamic changes such as increase of blood pressure and heartbeats that in many patients causes to emerge irreparable effects. Therefore, prevention from the intended changes is very vital for mentioned patients [13] and [14]. Although, the mechanism of increase of blood pressure and heartbeat within the intubation depends on the severe and short-term sympathetic stimulation arising from laryngoscopy in patient under general anesthesia; but, at the time of extubation, different factors such as the pain arising from wound, waking up from anesthesia and stimulation of chip have role in creating these hemodynamic changes [15]. Therefore, controlling these cardiovascular changes has been necessary and different drugs have been already suggested for this purpose such as Fentanyl, Esmolol Lidocaine, [16].

The effects of Lidocaine on blood pressure and heartbeat in responding to the extubation were studied by Bidowsky and his group, they poured 1.5 cc of Lidocaine 4% into the chip tube for 3 - 5 minutes before extubation and within extubation, and they poured one cc of the second dose of Lidocaine 4% into the chip tube. No kind of increase of blood pressure and heartbeat was seen during 1 to 5 minutes after extubation [17]. Also, the studies had indicated that injection of Lidocaine into the chip tube causes to block the airway receptors and consequently constrain the cough that the study of Tavakkol *et al.*, also indicated it;

Table 1. Comparison of the frequency of bucking amount in four groups under study.

	With bucking	Without bucking	P value
Alfentanil	18 (42%)	25 (58%)	0.001
Lidocaine	11 (25.5%)	32 (74.5%)	
Alfentanil-Lidocaine	18 (18%)	25 (58%)	
Witness	31 (72%)	12 (28%)	

but, in the continuation, Bidrowsky had reported that the changes of cardiovascular indexes are minimized in this method, a result that the study of Tavakkol didn't indicate it [18]. Also in a study, composition of Lidocaine with Captopril caused significant reduction in hemodynamic changes that in the Lidocaine group, these changes weren't lonely seen. Also in our study, Lidocaine lonely had good effect on reduction of bucking after extubation; but, it had no effect on reduction of hemodynamic symptoms.

Also in studying the time of extubation, Lidocaine like Alfentanil caused to increase the time of extubation; but, this difference wasn't significant in comparison with witness group that these results are similar with the study of Anderson and *et al.*, in a manner that in their study, injection of Lidocaine doesn't cause to increase the time of sedation and anesthesia for extubation [19].

Prescription of narcotic drugs intravenously before waking up from anesthesia is useful for prevention from cough, agitation and hemodynamic responses. Delay of recovery time, nausea and vomit arising from narcotic drugs are from the defects of prescription of narcotic drugs. Prescription of a short-effect narcotic drug is a trustable and safe method for prevention from cough during waking up from anesthesia.

Alfentanil has been a short-effect opioid which has a short half-life too. In the study of Mar'ashi, it was indicated that 10 µg/kg of Alfentanil caused to reduce and stabilize the systolic blood pressure after extubation. Also in his study, it was indicated that injection of Remifentanil in comparison with Alfentanil causes to reduce the average arterial blood pressure and diastolic blood pressure [20]. Also in our study, Alfentanil caused to reduce the systolic blood pressure; but, it didn't have any effect on average arterial blood pressure and diastolic blood pressure in comparison with other groups that these results are aligned with above study.

Also in the study of Fuhrman, comparison of Smolol and Alfentanil in reduction of hemodynamic side effects after extubation indicated that Alfentanil like Smolol caused to reduce the hemodynamic effects after extubation; but, it caused to increase the time of extubation [21] that in our study, Alfentanil group in comparison with the group of Alfentanil and Lidocaine composition and witness group caused to increase the time of extubation that this difference was significant. But, in the study of Mendel, prescription of Alfentanil caused to reduce bucking, coughing and hemodynamic effects after extubation without elongation of extubation time [22].

Also, in relation with the amount of creation of airway reflexes after extubation like coughing and bucking, in the study of Sadeghi and *et al.*, it was indicated that Alfentanil in comparison with Lidocaine had caused to reduce the amount of these side effects after extubation without elongation of extubation time [23], while in our study, it was indicated that the frequency of bucking amount in the Lidocaine group was less than two other treatment groups; but, generally all three groups had less amount than witness group that this difference was also significant statistically.

5. Conclusion

With regard to the results of this study that we witnessed the reduction of the mean of SBP and heartbeat in the Alfentanil and Alfentanil-Lidocaine groups and also reduction of bucking amount in both groups but in less amount in Lidocaine group, we didn't have significant reduction in the Lidocaine group in terms of the amount of heartbeat and SBP. It can be concluded that the composition of Lidocaine and Alfentanil can cause good effect on reduction of side effects arising from extubation, but adding Lidocaine doesn't cause better effect and it is the important point in increase of the time of extubation in comparison with witness group that this 3-minute difference can not reduce the importance of this issue so much.

Limitation

This study had a limitation and it was about patients' consent. Many patients did not want to enter the study.

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