Int. J. New. Chem., 2022, Vol. 9, Issue 3, pp 454-462.

International Journal of New Chemistry

Published online in http://www.ijnc.ir/

Open Access

Print ISSN: 2645-7237

Online ISSN: 2383-188x

Original Research Article

Effects of fentanyl and sufentanil on hemodynamic status due to endotracheal intubation in patients undergoing Coronary-Artery-Bypass-Graft [CABG] surgery

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Received: 2021-12-16 *Accepted: 2022-01-10* *Published: 2022-01-20*

ABSTRACT

Introduction: Hypertension usually begins 5 seconds after intubation and peaks within 1 to 2 minutes, returning to baseline after 5 to 10 minutes. Due to the importance of this issue in this study, we aimed to investigate the effect of fentanyl and sufentanil on hemodynamic responses during laryngoscopy and intubation in patients undergoing Coronary-Artery-Bypass-Graft [CABG] surgery.**Material and Methods:** This prospective descriptive study was performed during 2018 in Shahid Madani Hospital [Tabriz University of Medical Sciences] with the participation of 40 patients undergoing CABG surgery. Patients were injected with fentanyl or sufentanil before intubation and after 2 minutes of intubation. The response of blood pressure [systolic and diastolic] and HR to intubation were measured between the two groups. **Results:** The mean rate of change of the two groups was analyzed using repeated measures analysis of variance, which generally shows significant changes in the rate of change in HR per minute [p-value = 0.0001]. Also, there is no statistically significant difference in the rate of change in HR per minute between the two groups [p-value = 0.758] and it can be said that the two drugs did not have different effects.**Conclusion:** In general, no statistically significant differences were observed between the two drug groups. In fact, although both fentanyl and sufentanil modulated hemodynamic changes due to the cardiovascular response to intubation, no significant difference was observed between them in terms of drug effect.

Keywords: Tracheal intubation, Hemodynamic status, Fentanyl, Sufentanil, CABG

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Introduction

These changes are well tolerated in people without heart problems, but in patients with cardiovascular problems as well as patients with high blood pressure [1], especially uncontrolled, can cause many complications, including ischemia and cardiac dysrhythmias [2]. Many drugs have been used to attenuate these responses, including opioids, beta-blockers, vasodilators, and calcium channel blockers [3]. As an agonist, fentanyl binds to opioid receptors and affects pain sensation, thereby exerting its analgesic effect for moderate to severe pain. The effects of this drug are to weaken the CNS and respiratory system like morphine. The hypnotic effect of this drug is very low and rarely causes the release of histamine. [4, 5]. The half-life of sufentanil is 2.5 hours and is bound to plasma proteins [90%], metabolized in the liver, and excreted in the small intestine by N. alkylation and O demethylation and its metabolite in the urine. The pharmacokinetics of sufentanil may vary depending on the age and condition of the patient and the surgery. For example, the half-life of sufentanil is longer in a patient undergoing heart surgery. [About 595 minutes] and in hyperventilation patients [232 minutes] and in abdominal aortic surgery is more than 12 hours [6, 7]. Hypertension usually begins 5 seconds after intubation and peaks within 1 to 2 minutes, returning to baseline after 5 to 10 minutes. Due to the importance of this issue in this study, we aimed to investigate the effect of fentanyl and sufentanil on hemodynamic responses during laryngoscopy and intubation in patients undergoing coronary artery bypass graft surgery.

Material and Methods

The present study is a descriptive prospective study based on a table of random numbers after obtaining consent [which is attached] from 40 patients aged 20-50 years who are candidates for elective surgery with general anesthesia, ASA class I, II without prodrug therapy and fasting. With no history of heart or brain disease, high blood pressure, addiction and drug use were randomly selected and divided into two groups of 20 people. All patients were prehydrated with 7 ml / kg ringerlactate before drug administration. In the first group fentanyl 2 μg / kg and in the second group sufentanil 0.2 μg / kg, 3 minutes before endotracheal intubation [induction of anesthesia] and laryngoscopy were injected intravenously for 30 seconds. The anesthesia method was the same in both groups except for narcotics. The intubation time was 20 seconds.

SBP, DBP and HR were measured before drug administration, before laryngoscopy and intubation, and 1 and 2 minutes after laryngoscopy and intubation, the mentioned variables were measured and recorded again. BP and HR were monitored in all cases by one person and by a single device. The person controlling BP and HR did not know the type of sample. After collecting and recording them in the computer using statistical software such as SPSS version 18 and Excell to draw tables and graphs of frequency distribution and then to compare the means in quantitative data of parametric tests such as t. test and analysis of variance and If the data were abnormal, non-parametric tests such as Mann Whitney were used. The significance level of the tests was considered to be 5%. The present study began by stating the research objectives in simple language for patients. The code [IR.TBZMED.REC.1400.058] of ethics was obtained from Tabriz University of Medical Sciences. Informed consent was completed for all patients.

Results

The mean change of the two groups was examined using analysis of variance with repeated measures, which showed that the age variable had a statistically significant effect on the rate of change in SBP. [p-value = 0.037] There is also no statistically significant difference in the rate of change in SBP between the two groups [p-value = 0.307]

Table 1: Comparison of changes in SBP in the two groups participating in the study

Systolic			SD	Mean	Max	Min
20-35 years old	Before drug injection	Fentanyl	11	115.12	125	100
		sufentanil	14	124.45	134	100
	Before Intubation	Fentanyl	14	121.96	129	85
		sufentanil	15	135.54	144	105
	1 minute after Intubation	Fentanyl	16	145.87	154	96
		sufentanil	14	140.87	145	124
	2 minutes after Intubation	Fentanyl	15	138.75	142	92
		sufentanil	17	136.73	133	115
35 -50 years old	Before drug injection	Fentanyl	18	144.53	148	108
		sufentanil	18	147.57	152	99
	Before Intubation	Fentanyl	15	133.95	141	85
		sufentanil	15	136.91	145	82
	1 minute after Intubation	Fentanyl	16	154.96	162	91
		sufentanil	17	162.74	172	90
	2 minutes after Intubation	Fentanyl	17	157.41	169	98
		sufentanil	16	149.63	162	89

The mean change of the two groups was analyzed using repeated measures analysis of variance, which generally shows significant changes in DBP [p-value = 0.0001]. Also, there is no statistically significant difference in the amount of changes between the two groups [p-value = 0.51] and it can be said that the two drugs did not have different effects.

Table 2: Comparison of changes in DBP in the two groups participating in the study

DBP			SD	Mean	Max	Min
20-35 years old	Before drug injection	Fentanyl	8	78.85	95	60
		sufentanil	8	75.52	95	60
	Before Intubation	Fentanyl	12	79.82	96	60
		sufentanil	12	81.96	98	60
	1 minute after Intubation	Fentanyl	14	83.63	100	65
		sufentanil	14	85.93	98	65
	2 minute after Intubation	Fentanyl	14	81.74	97	65
		sufentanil	14	86.71	96	70
35 -50 years old	Before drug injection	Fentanyl	14	90.71	100	70
		sufentanil	14	91.75	102	70
	Before Intubation	Fentanyl	15	90.53	105	75
		sufentanil	15	88.73	104	70
	1 minute after Intubation	Fentanyl	15	91.95	103	75
		sufentanil	15	162.91	95	70
	2 minute after Intubation	Fentanyl	15	89.46	95	70
		sufentanil	15	91.15	12	70

The mean rate of change of the two groups was analyzed using repeated measures analysis of variance, which generally shows significant changes in the rate of change in HR per minute [p-value = 0.0001]. Also, there is no statistically significant difference in the rate of change in HR per minute between the two groups [p-value = 0.758] and it can be said that the two drugs did not have different effects.

Table 3: Comparison of HR changes in the two groups participating in the study

HR			Max	Min
20-35 years old	Before drug injection	Fentanyl	100	85
		sufentanil	124	94
	Before Intubation	Fentanyl	118	95
		sufentanil	136	96
	1 minute after Intubation	Fentanyl	103	102
		sufentanil	104	105

	2 minute after Intubation	Fentanyl	114	103
		sufentanil	127	100
35 -50 years old	Before drug injection	Fentanyl	108	88
		sufentanil	114	95
	Before Intubation	Fentanyl	106	98
		sufentanil	107	102
	1 minute after Intubation	Fentanyl	114	105
		sufentanil	124	103
	2 minute after Intubation	Fentanyl	104	104
		sufentanil	111	104

Discussion

20 patients in the fentanyl group and 20 patients in the sufentanil group were studied. The mean age in the fentanyl group was 33.65±8.99 years and in the sufentanil group was 37.99 ±12.07 years, which according to P = 0.524 can be said that the two groups were not statistically significant in terms of age. Overall, 47.5% of the subjects were men and 52.5% were women, of which 40% were men and 60% were women in the fentanyl group, and 55% were men and 45% were women in the sufentanil group. According to P = 0.342, again, there is no significant difference between the two groups in terms of gender of the subjects. The mean weight in the fentanyl group was 67.7 ±12.92 kg and in the sufentanil group was 67.65 ± 11.19 kg. According to P = 0.99, it can be said that the two groups did not show a significant difference in terms of weight average. The distribution of SBP in patients was examined based on different times. The mean SBP before drug administration in fentanyl and sufentanil groups were 122 ± 12.1 [[range 140-100] and 125 ± 16.1, respectively. [Range 162-100] mm Hg. These cultivars were 108.1 ±15.71 and 118.95 16 17.16 mm before intubation, respectively, and one minute after intubation were 83.25 ±15.31 and 91.25 ±12.74. Mm of mercury decreased [8 10].

But two minutes after intubation, the mean in the two groups was 122.75 ±19.46 and 127.65 ±13.59 mm Hg, respectively, which was also increased from the baseline. In general, significant changes in SBP are observed [P=0.0001], but there is no statistically significant difference in the rate of changes in BP in the two groups [P=0.423] and it can be said that the two groups have different effects [11]. Have not. Also, the mean rate of change in SBP based on sex in the two groups was examined, and it was found that this variable had no significant effect on the rate of change in SBP [P = 0.153]. Also, changes in SBP did not show a significant difference between

men and women [P = 0.489], but a significant effect was observed in the effect of age on the rate of changes in SBP [P = 0.037]. The increase in blood pressure one minute after intubation was more significant in the age group of 35-50 years than 20-35 years. But in the general study of the two groups, no significant difference was observed. The effect of weight variable on the rate of changes in BP was not significant [P = 0.868], so that the two weight groups of 40-70 kg and 71-100 kg did not show significant differences with each other [12–14]. In a similar study comparing remifentanil with fentanyl, the prevalence of SBP increased significantly by more than 30% of baseline values during the study period in the fentanyl group compared to group R, but the prevalence of SBP decreased by <30% of baseline values. Was significantly lower in the fentanyl group than in the remifentanil group. Another study, like ours, did not show a clear difference in SBP between the remifentanil and sufentanil groups. Another study did not find a clear difference in SBP between the two groups [sufentanil and pethidine][15 , 16]. In a similar study, contrary to the results obtained in the study, the mean percentage increase in SBP after intubation was significantly lower in the sufentanil group. [7% in sufentanil group and 17% in fentanyl group, P <0.05]. On the other hand, the increase in SBP by> 30% of baseline during the study period was significantly higher in the fentanyl group. [05/0 P <]. In another study, the mean change in SBP of the mothers before and after induction of anesthesia in the two groups [remifentanil] and control [same as normal saline] showed a statistically significant difference [P <0.001] and these changes in the group. The case was less. In another study, there was a significant difference between the mean difference between SBP before induction of anesthesia and its value immediately after endotracheal intubation and 10 minutes after endotracheal intubation, in case group [with intravenous alfentanil] and control group [without alfentanil]. So that in the control group compared to the case group, the rate of SBP was higher after intubation. In a study that examined the two groups of midazolam + morphine with midazolam + fentanyl, there was a significant difference between the changes in SBP between the two groups [P = 0.003]. However, in our study, DBP in patients was evaluated before drug administration and intubation and after that the general trend of changes was significant [P = 0.0001]. However, there was no significant difference between the two groups of patients who received fentanyl and sufentanil before intubation [P = 0.555], so it can be said that the two drugs had the same effect on the process of DBP changes in these patients. Also, gender variable had no significant effect on the rate of changes in DBP [P = 0.103]. There was no difference in the effect of drug based on

gender between the two drug groups. [P = 0.654] age groups did not have a significant effect on the trend of changes in DBP [P = 0.144] nor did the two drugs show different effects based on age [P = 0.53]. This was also the case based on weight. In fact, patients' weight had no effect on changes in DBP. [711/0 = P]. The two weight groups [40-70 kg and 71-100 kg] did not show any difference in the effect of either drug. [P = 0.061] In a similar study conducted by researchers, as in our study, there was no clear difference in DBP between the two groups of remifentanil and sufentanil. This conclusion was similar to the similarity of the effects of fentanyl and sufentanil in our study[3 , 18]. The trend of HR change was examined, which in general showed significant changes in HR per minute [P=0.0001]. But there was no statistically significant difference in HR changes between the two drug groups. In fact, it can be said that the two drugs did not have different effects [P = 0.758]. Gender, weight and age of patients had no significant effect on the process of HR changes. In a similar study by researchers, different results were obtained. The decrease in HR after induction of anesthesia was greater in the remifentanil group than in the fentanyl and sufentanil groups. Was lower in the control group. [P <0.05] But the mean percentage increase in HR during intubation was significantly lower in the sufentanil group [10%] than in the fentanyl group [25%] [P <0.05], the increase in HR was more More than 30% of baseline values during the study period were significantly higher in the fentanyl group [43%] than in the sufentanil group [3%] [P <0.05] [11 , 16].

Conclusion

In general, although the changes in SBP during the study period were significant [P = 0.0001], but no significant difference was observed between the two groups. Gender and weight of patients had no significant effect on SBP, but the effect of age was significant. [P = 0.037] so that the mean SBP after intubation was higher in the age group of 35-50 years compared to 20-35 years. The trend of changes in DBP and HR was also significant in patients [P = 0.0001] but the variables of age, sex and weight had no significant effect on them. Also, in general, no statistically significant differences were observed between the two drug groups. In fact, although both fentanyl and sufentanil modulated the hemodynamic changes induced by the cardiovascular response to intubation, no significant difference was observed between them in terms of drug efficacy. [05/0> P]

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How to Cite This Article

Sahar Sadeghi, Hassan Mohammadipour Anvari, "**Effects of fentanyl and sufentanil on hemodynamic status due to endotracheal intubation in patients undergoing Coronary-Artery-Bypass-Graft (CABG) surgery**" International Journal of New Chemistry., 2022; DOI: 10.22034/ijnc.2022.3.12.