CAN ALFENTANIL OR DILTIAZEM PREVENT MYOCARDIAL ISCHEMIA DUE TO TRACHEAL INTUBATION?

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ABSTRACT

Objective: The aim of this study is to evaluate the efficacy of alfentanil and diltiazem to attenuate the cardiovascular responses to laryngoscopy and tracheal intubation and their effects on the occurrance of myocardial ischemia in patients with coronary artery disease.

Methods: Twenty eight patients ASA II-III, 40-80 years old, scheduled for elective abdominal surgery were randomly assigned into three groups. Anesthesia was induced with 0.2 mg/kg etomidate and 1.5 mg/kg succinylcholine i.v. in all patients. In group I (n=10) 15 µg/kg alfentanil i.v. and in group II (n=10) 0.2 mg/kg diltiazem i.v. were administered 2 minutes before laryngoscopy. In group III (n=8) (control) no medication was administered. Systolic, diastolic, mean arterial pressure, heart rate, rate-pressure product and ST segment changes in DII and V5 leads were recorded before and after induction at 1., 3., 5. minutes of intubation.

Results: Mean arterial pressure was significantly lower in the alfentanil and diltiazem group 1 minute after intubation. There was no significant difference in heart rate between groups. Rate-pressure product was greater than 11000 in all patients of diltiazem and control groups and in 9 patients of alfentanil group.

Conclusion: Although 0.2 mg/kg diltiazem and 15 µg/kg alfentanil i.v. attenuated the hypertensive response to tracheal intubation, they were found to be ineffective in decreasing the incidence of myocardial ischemia in coronary artery disease.

Key Words: Myocardial ischemia, alfentanil, diltiazem. Tracheal intubation, hemodynamic response.

INTRODUCTION

Laryngoscopy and tracheal intubation causing significant increases in arterial blood pressure and heart rate lead to deleterious effects on myocardium of patients with coronary artery disease (CAD) (1). Patients with CAD are frequently anesthetized for cardiac surgery as well as non-cardiac operations. In these patients, ECG should be used to identify myocardial ischemia and rhythm disturbances during the stress of anesthesia and operation. Previous studies showed that, 89% of the ST segment information in the conventional 12 lead ECG is found in lead V5 (2). One mm or greater horizontal-down slopping ST segment depression, two mm or more ST segment elevation from baseline for more than sixty seconds is considered a sign of myocardial ischemia until proven otherwise (3-5).

The aim of the study is to evaluate the efficacy of alfentanil and diltiazem to attenuate the cardiovascular responses to tracheal intubation and their effects on the occurrance of myocardial ischemia in patients with CAD.

PATIENTS AND METHODS

After obtaining Institutional Ethics Committee approval and patients' written consent, 28 patients with CAD, ASA II-III, aged 40-80 years and scheduled for elective abdominal surgery were randomly assigned into three groups. In all patients, anesthesia was induced with 0.2 mg/kg etomidate and 1.5 mg/kg succinylcholine i.v. In group I (n=10) 15 µg/kg alfentanil i.v. and in group II (n=10) 0.2 mg/kg diltiazem i.v. were administered 2 minutes before laryngoscopy and intubation. In group III (n=8) (control) no medication was administered. Anesthesia was maintained with 50% N20 in oxygen

and isoflurane (MAC was maintained according to the hemodynamic parameters during maintenance of anaesthesia). A five lead ECG was attached on arrival to the operating room and lead II and V5 were displayed continuously. A 20G cannula was inserted into the radial artery for blood pressure monitorization. Systolic, diastolic, mean arterial pressure (MAP), heart rate, rate-pressure product (RPP) which is the product of heart rate multiplied by systolic arterial pressure and ST segment changes in lead II and V5 were recorded before induction (T1), after induction (T2), at 1. (T3), 3. (T4), 5. (T5) minutes of intubation. ST segment displacement was measured at a point 0.08 second after the J point. >1mm horizontal or down-slopping ST segment depression or >2mm ST segment elevation from baseline for more than 60 seconds was considered a significant sign of myocardial ischemia. Also ECG findings and CPK-MB levels were evaluated at 6., 12., 24. hours postoperatively. Results were analysed statistically with ANOVA, Friedman, Tukey Kramer and Dunn's Multiple Comparison tests ($p<0.05$).

RESULTS

The three groups were comparable in respect to age, weight and sex ($p>0.05$) (Table I)

There was no significant difference in MAP between the groups before induction. The decrease in MAP after induction in alfentanil and diltiazem groups compared with the control group was significant ($p<0.05$). The increase in MAP in response to laryngoscopy and intubation in the control group compared to alfentanil and diltiazem groups was significant ($p<0.05$) (Table II).

There was no difference in heart rate before induction or immediately after laryngoscopy and intubation between the three groups ($p>0.05$). In diltiazem and control groups the increase in heart rate immediately after laryngoscopy and intubation was significant ($p<0.01$) (Table III).

RPP was significantly lower in the alfentanil group compared with the control after induction and three minutes after laryngoscopy ($p<0.01$). It was also significantly lower in the alfentanil and the diltiazem groups compared with the control after laryngoscopy and intubation ($p<0.001$, $p<0.05$) (Table IV).

In each group, 2 of 10 patients (20%) had ST segment depression during intubation. CPK-MB levels increased above 24 IU/ml in 5 patients of alfentanil and control group and 4 patients of diltiazem group ($p>0.05$). One patient in the control group had documented myocardial infarction 6 hours after the operation.

Table I. Demographic data of patients (Mean±SD)

	ALFENTANIL	DILTIAZEM	CONTROL
Patients (n)	10	10	8
Sex (M/F)	6/4	6/4	5/3
Age (year)	66.5 ± 5.5	64.2 ± 3.5	66.1 ± 3.2
Weight (kg)	70.2 ± 2.5	74.6 ± 5.2	70.3 ± 3.8

Table II. Mean arterial pressure of patients (mmHg) (Mean±SD)

	ALFENTANIL	DILTIAZEM	CONTROL
T1	100.0 ± 12.40	105.5 ± 6.43	111.62 ± 12.95
T2	98.4 ± 15.85 *	96.10 ± 11.61 *	114.87 ± 11.76
T3	119.1 ± 32.39 *	125.3 ± 19.07 *	154.50 ± 18.15
T4	113.0 ± 17.28	116.0 ± 21.6	130.75 ± 14.61
T5	105.5 ± 29.79	111.0 ± 26.24	108.37 ± 16.63

* $p<0.05$ compared to control

Table III. Heart rate of patients (Beat/min) (Mean±SD)

	ALFENTANIL	DILTIAZEM	CONTROL
T1	81.7 ± 13.33	87.60 ± 18.67	92.63 ± 28.52
T2	77.5 ± 12.31 *	94.10 ± 17.44	101.25 ± 24.70
T3	94.8 ± 19.60	109.6 ± 20.02 ***	113.63 ± 24.30 **
T4	87.7 ± 18.11	99.60 ± 19.68	102.30 ± 21.46
T5	75.0 ± 13.92	82.10 ± 12.78	82.75 ± 20.13

* p<0.05 compared with control
** p<0.01 within the group
*** p<0.001 within the group

Table IV. Rate-pressure product of patients (Mean±SD)

	ALFENTANIL	DILTIAZEM	CONTROL
T1	11821.7 ± 2553.7	14134.4 ± 3707.9	17946.0 ± 4966.2
T2	10740.0 ± 2709.9**	13524.9 ± 3333.6	17138.2 ± 4974.6
T3	15864.5 ± 4800.4***	19967.0 ± 4068.7*	25895.3 ± 6053.9
T4	13085.6 ± 5662.7**	16753.4 ± 4785.3	21340.0 ± 3950.9
T5	11442.5 ± 3625.7	12736 ± 3344.7	13270.3 ± 3200.0

* p<0.05, ** p<0.01, *** p<0.001 compared with control

DISCUSSION

Patients suffering from angina pectoris are particularly prone to developing intraoperative myocardial ischemia. The narcotic anesthetic techniques having the advantage of minimal myocardial depression are often used in patients with coronary artery disease (6). To attenuate the catecholamine and cardiovascular responses to brief but intense noxious stimuli such as tracheal intubation, alfentanil may be the most appropriate narcotic agent (7). Diltiazem; a calcium channel blocker with potent vasodilatory and hypotensive properties has been used for treatment of hypertension and angina pectoris (8).

Previous studies confirmed that laryngoscopy and intubation after thiopentone and etomidate alone was accompained by significant increases in heart rate and arterial pressure above control levels (9). Mikawa et al. (10) found that diltiazem in a dose of 0.2mg/kg attenuated the increases in blood pressure, heart rate and RPP after tracheal intubation compared with the control group. The same results were obtained in Miller et al's (11) study with alfentanil 15μg/kg. We also observed that 15μg/kg alfentanil and 0.2mg/kg diltiazem were both effective in obtunding that hemodynamic responses to laryngoscopy and intubation compared with the control group. Mikawa et al (10) observed that there was an increase in heart rate after induction in patients treated with diltiazem 0.2mg/kg and 0.3mg/kg. However in our study, there was no significant difference in heart rate between the diltiazem and control group after induction while significant decrease was observed at this time in the alfentanil group. Also after laryngoscopy only in alfentanil group, the increase in heart rate was not significant suggesting that alfentanil was more effective in controlling heart rate compared to diltiazem.

Ray et al (12) stated that the patients with CAD having RPP>11000 had ST segment depression and the increased RPP occurred most often during intubation. Rifkin et al (13) showed that in patients with known ischemic cardiac disease, the ST segment displacement correlates well with ischemia. In Mikawa's (10) study, in patients treated with 0.2mg/kg and 0.3mg/kg diltiazem, RPP was 14000 and 11914 respectively whereas in our study RPP after intubation was 19967 and 15864 in diltiazem and alfentanil group respectively. Although the RPP showed an attenuated response with alfentanil and diltiazem after laryngoscopy, in each group 2 of 10 patients had ST segment depression.

We concluded that 0.2mg/kg diltiazem and 15µg/kg alfentanil i.v. administered during induction attenuated the increase in rate pressure product after intubation and alfentanil was more effective in controlling heart rate, however they were found to be unrelated on the occurrence of myocardial ischemia in patients with CAD as 20% of patients in all groups and had ST segment depression.

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