Influence of Clonidine on the Chemodynamic Stability and Stress Response in the Course of Surgery on General Anesthesia

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This work provides results of therapeutic efficacy testing and clonidine toleration in moderating of perioperative tachycardia and hypertension, as well as reducing the needs for anaesthetic drugs, thus providing better patients’ cardiovascular stability. **Material and methods:** The study involved 60 patients, that were subdued to elective non-cardiosurgical operations in general anaesthesia. One half of the patients was administrated the Clonidine, 0,2µg/kg/min in solution, while the other half served as a control group. **Results:** of the study it was evident that the Clonidine group had considerably less stress response, which was shown through variation of cortisol levels during operation, glicemy levels and vital parameters. There was a statistically significant difference (p<0,001) in cortisol serum levels and glicemy between these two groups. Complications during anesthesia were fewer in the Clonidine group, and the consumption of anesthetic drugs was also lower. **Conclusion:** Clonidine effects were favourable during anesthesia. **Key words:** α₂-agonists, clonidine, anesthesia, fentanyl, blood pressure, heart rate, hypertension, tachycardia.

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1. INTRODUCTION

Of all the relevant components constituting a neuroendocrine response to the pre-operative trauma, the most important one is catecholamine, or sympathoadrenaline response to the surgical stimulation (1). Measuring the concentration of the catecholamine during an anaesthesia and surgery showed that the cardiovascular responses to stress (hypertension and tachycardia) are primarily caused by the increased levels of adrenaline in the plasma and the locally increased levels of noradrenaline in synapses (2).

By following the concentration of the stress hormones during the administration of various anaesthetic agents it has been established that the inhalatory anaesthetics lower the base secretion of catecholamine, but not the sympathoadrenal response to the surgical stimuli and the opiates given before the commencement of the surgery, and partially lower the secretion of the catecholamine, but not if administered later.

Clonidine is a prototype of α₂ agonist medicines, where its basic effect is sympatholytic and it is therefore traditionally administered as an antihypertensive agent. The most recent scientific studies discovered its sedative, anxiolytic and analgetic effects also, which lower the level of the necessary anaesthetic agents, which makes the interest for clonidine, as a potential agent in clinical anaesthesia, justified. The same studies also showed that Clonidine lowers the stress response before and after the surgery and it causes lesser oxygen consumption, which is indicative of the sympathetic activation, and at the same time it lowers the risk of myocardial ischaemia. However, the administration of clonidine, as an anaesthetic adjuvant remains the subject of additional research.

2. PATIENTS AND METHODS

This prospective study and research covered sixty (60) patients ASA I and II (American Society of Anaesthesiology), ages ranging between 30 and 60, of both sexes. Patients were prepared for the elective general surgery, gynaecology and orthopaedics.

Patients were, arbitrarily, divided into two groups; group A – Clonidine and group B – control group. One half of the patients, 30 of them, received Clonidine and the remaining half or 30 patients in the control group received physiological solution. Both groups were comparable based on sex, average age and body mass. The study did not include patients with complicated organ ailments, which could in any way compromise their cardiovascular function. Thirty minutes prior to anaesthesia Clonidine was administered to the assigned group with the speed of 0,02 ml/kg/min. This speed does not change ba-
correlated with the lowering of the total consumption of Fentanyl and inhalatory anaesthetic. The assessment of the speed of recovery from anaesthesia was done by measuring the time that elapsed from the moment of stopping with the administration of the inhalatory anaesthetic until the moment when the patient can follow simple commands (open eyes on command), or until the patient spontaneously opens the eyes and becomes fully conscious. The consumption of Atropine was used as an indicator of the level of negative chrontropic activity of the drugs used. As a parameter of the strength of the stress reactions, the increase in plasma cortisone and the increase in the glucose values, measured during the surgery were used and compared to the base pre-operative values.

3. RESULTS

We emphasize that the Clonidine and the control group were comparable based on age, weight and sex and that there were no statistically significant differences between the patients of both groups. Below are shown intrapre-operative results of the measured parameters of both groups.

It is noticeable that the patients in the Clonidine group were waking up from general anaesthesia faster and the time necessary for eye opening and consciousness was much faster and the time necessary for eye opening and consciousness was much faster and the time necessary for eye opening and consciousness was much faster. In the Clonidine group the patients were waking up significantly less variation in the systolic pressure in all critical phases.

It is noticeable that the patients of the Clonidine group have significantly less variation in the diastolic pressure especially during the phases of intubation, surgical manipulation and extubation.

There is a significantly lower variability in the heart frequency in the Clonidine group during the anaesthesia phases that were observed.

In the Clonidine group during the surgery Clonidine increased for, approximately 1.5 times in relation to the pre-surgery base values. In the control group, during the surgery we noted a significantly higher increase of cortisone (p<0.001), approximately 3 times in comparison to the base pre-surgery values.

In the Clonidine group the levels of glycemia did not cross over the reference values (6.5mmol/l), while in the control group the glycemia level was significantly higher (p<0.001) (8.3mmol/l), in comparison to the patients in the Clonidine group.

In the Clonidine group there was a significantly lower consumption of: Droperidol, Pavulon and Sevorane, while the administration of Fentanyl and Atropine did not statistically differ in the Clonidine and controlled groups.

In the Table 2 there are expressed parameters which define the speed and the quality of overcoming (waking up) from general anaesthesia. In the Clonidine group the patients were waking up faster and the time necessary for eye opening and consciousness was much shorter.

4. DISCUSSION

Selective agonists of α₂ adrenoreceptors have an important role in anaesthesia.
its affect on pain through the $\alpha_2$ adrenoreceptors. This effect of the agonist $\alpha_2$ adrenoreceptor, exhibited through the central and spinal receptors is sympatholytic and leads to moderate lowering of the blood pressure and heart frequency, as well as the wide spectre of other occurrences, including analgesic, anaesthesia and sedation, as well as lower consumption of oxygen, energy and production of CO$_2$. The differences in pharmacological and clinical reactions can be explained by the differences in selection (9).

The key factor of this phenomenon is the size of the initial dose. With the proscribed clinical doses of the medicine in the plasma from 0.7-1.5 nanogram/ml there is a slight lowering of the systemic blood pressure and of the frequency. This same efficacy has been confirmed in our study. Clonidine, administered in the course of pre-medication in the dose of 0.2 µg/kg/min, has successfully suppressed the hypertensive-tachycardic response during the intubation of the trachea and surgical manipulation (as evident in Table 5). It is evident that Clonidine is especially successful in repressing the post-intubation tachycardia and the tachycardia caused by the surgical manipulation, which is especially important for the patients suffering from the coronary disease and compromised cardiac output, where a tachycardia significantly lowers the amount of blood that during the diastole enters the left chamber.

In the tracheal extubation phase there are also pain impulses which increase the blood pressure and cause the increased heart rate. The mechanism of this phenomenon is also sympathoadrenal. Clonidine has successfully suppressed the hypertensive-tachycardic response, which corresponds to the data available in literature.

5. CONCLUSION

Complications during anesthesia were fewer in the clonidine group, and the consumption of anesthetic drugs was also lower. So, clonidine effects were favourable during anaesthesia in any phase of performed surgery.

REFERENCES