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The Solution to the Problem of a Heart Rhythm Recovery with Modern Methods

Gradskaya Anastasia Igorevna[1], Vitaliy Alekseevich Solovyov[2], Maksimova Irina Valeryevna[3], Egorova Anastasia Yurievna[4], Grishachkina Nadezhda Igorevna[5]

[1,2,3,4]6th year student of the Faculty of Medicine, Federal State Budget Educational Institution of Higher Education Tver State Medical University of the Ministry of Health of Russia, Tver.

[5]5th year student of the Faculty of Medicine, Federal State Budgetary Educational Establishment of Higher Education Tver State Medical University of the Ministry of Health of Russia, Tver

E-mail: gradskaya.anastasia@yandex.ru , vitalick.solovyov@yandex.ru , maksimova.irina2014@gmail.com , elgaash@mail.ru , nadiagrishachkina@mail.ru

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ABSTRACT

In this article, we will consider how the problem of rhythm recovery has been being solved under modern conditions. We will consider the effectiveness of the domestic class III drug - Refralon, based on the study of the Department of Clinical Electrophysiology and X-ray surgical methods of recovery of heart rhythm disorders at the Federal State Budget Scientific Research Center of Cardiology of the Russian Ministry of Health. We will also take a closer look at the "Development of an electronics unit with a long-term cardio-monitoring function for using it in wireless pacing" led by Olga Bokeria. They developed an improved electric cardiac pacemaker model designed for patients with cardiac arrhythmias, in particular bradycardia.

Key words: ciliary arrhythmia, sinus rhythm, domestic drug, pacing, cardiovascular surgery.

Correspondence:
Gradskaya Anastasia Igorevna
6th Year Student of the Faculty of Medicine, Federal State Bedget Educational Institution of Higher Education Tver State Medical University of the Ministry of Health of Russia
Tver
E-mail: gradskaya.anastasia@yandrexru

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INTRODUCTION

Treatment of ciliary arrhythmia (CA), even considering wide experience gained by clinical medicine, remains a complex and multifaceted task. Despite the large number of studies, publications, recommendations, in each case, a number of difficult questions has to be solved: which type of treatment, conservative or surgical should be chosen? Whether will it be safe and effective treatment? What type of drug should be used? Will the course of arrhythmia and the nature of the underlying disease affect the outcome of therapy, etc.

In recent years three types of CA have been proposed to distinguish:

1) paroxysmal form: short attacks of CA (up to 24 hours), capable of spontaneous cessation;

2) persistent form, which is sometimes called steady; It means longer attack of CA, which does not cease on its own, but can be eliminated with the help of medications for cardioversion (DCCV);

3) constant (stable) form of CA, characterized by inability to jugulate or recurrent after jugulation a few hours later. As you can see, the last two options are specifying a traditional concept of the constant form of CA.

The meaning of this classification is understandable - it consists of the urge to facilitate the approach to therapeutic tactics. However, in reality it is not so simple. In particular, the limitation of the period of paroxysmal CA by 24 hours (with all the attributes of its paroxysmal nature) is doubtful. The attack may stop in 2-3 days; sometimes it does not stop by itself, but taking small doses of antiarrhythmics by a patient himself can successfully help to recover the normal sinus rhythm (NSR).

Furthermore, if CA arose for the first time, it is impossible to predict its belonging to one form or another. In general, without clear anamnestic data, this classification does not "work", but meanwhile, a doctor is often deprived of the opportunity to study this anamnesis, and a patient cannot help him with this. Then, the attaching of CA to a constant (stable) form can be very conditional - too often, doctors do not use all possible methods of stopping CA (for example, using DCCV).

Sometimes an unsuccessful attempt to recover NSR by a transthoracic discharge, CA is eliminated with the help of transesophageal cardioversion (with a good long-term result)! There are cases when, due to the low technical capabilities of a defibrillator (limitation of the discharge power), the NSR is not restored, but the use of another device (with a correspondingly more powerful pulse) eliminates CA. There may be cases when NSR not restored with the help of DCCV, is restored with the same DCCV after several days of premedication.

Finally, where is the guarantee of the full adequacy of anti-relapse drug therapy used in this particular case after the elimination of CA? The list of options unaccounted for by this classification could be continued.

RESEARCH

The purpose of this research is to consider modern methods of solving the problem of heart rhythm recovering. So, let us look at one of them. The drug Refralon is used to recover sinus rhythm in patients with ciliary arrhythmia (atrial fibrillation and flutter). Atrial fibrillation is the most common persistent form of cardiac arrhythmias. About 2.5 million patients live in our country, and this number is increasing. The disease is accompanied by severe clinical manifestations and significantly reduces the quality of patients' lives, which requires arresting arrhythmias in most patients.

Currently available antiarrhythmic drugs can help to recover the sinus rhythm only in patients with recently emerged arrhythmia. If the attack lasts for more than 2 days, their effectiveness is significantly reduced, and with a persistent (i.e., lasting more than a week) form of atrial fibrillation is practically equals to zero. That is why the electrical

cardioversion was the only way to recover sinus rhythm in patients with prolonged arrhythmia in the past.

According to the results of the study, the effectiveness of the drug in recovering sinus rhythm with persistent atrial fibrillation reaches 90% and is not inferior to electric cardioversion. The advantages of Refralon are that rhythm restoration does not require anesthesia and there is no risk of electrical cardiac injury (during electropulse therapy, the prevalence of complications due to anesthesia and electrical cardiac injury can reach 10%).

A new antiarrhythmic drug is produced by the Experimental Production of Biomedical Preparations of the Federal State Budgetary Institution Scientific Research Center for Cardiology of the Russian Ministry of Health. Refralon is included in the State Register of Medicines and can be used to recover the sinus rhythm of patients hospitalized at the Federal State Budget Scientific Research Center for Cardiology of the Russian Ministry of Health, as well as other cardiology hospitals.

One more modern method that we will analyze is "Development of an electronics unit with a function of long-term cardio-monitoring for the use in wireless cardiac pacing" under the supervision of Olga Bokeria. They managed to develop an improved model of a pacemaker designed for patients with cardiac arrhythmias, in particular, bradycardia. The apparatus for treating children and adults will be able to perform long-term cardio-monitoring, detect latent arrhythmias, increase the time between planned replacements of the device by half, up to 15 years, and will be cheaper than imported analogues.

The project is a member of the largest accelerator Generations from RVC in Russia and Eastern Europe.

The invention is based on a device made of a biocompatible titanium material with a size of 22 * 12 mm and a weight of up to 11 g. Unlike the endocardial pacemakers used in modern medicine, the device is not mounted inside the heart, but on the outer surface of the left ventricle. Thanks to this fixation of the device, the patient has a reduced risk of thromboembolic complications, as well as improved heart condition, minimized manifestations of heart failure, if it was at the time of implantation.

The device can be used to treat children. Due to the stimulation of the left ventricle, the epicardial pacemaker does not cause heart failure, which pacemakers performing right ventricular stimulation sooner or later trigger. Children have to walk with a stimulant all their lives, so the risk of developing heart failure increases. In addition, it was impossible to implant an endocardial pacemaker for children with a vessel diameter of less than 7-8 mm, since the diameter of the stimulator and delivery device was at least 5-6 mm. A pacemaker developed by the project team can be inserted through a small incision of 3-3.5 cm in the intercostal space or by thoracoscopy to a child of any age and weight.

There are no analogues of a wireless epicardial pacemaker yet. Endocardial, fixed in the right ventricle of the heart, wireless pacemakers are used in the world. Such pacemakers do not exclude the possibility of blood clots, infection, trauma to intracardiac structures, displacement of the stimulator into the lumen of the pulmonary artery with its full or partial blockage, and even rupture of the heart wall. Now, in the field of implantable devices there is a tendency to refuse wires, increase battery life, provide the most physiological stimulation of the heart without contact with blood.

There is a need for such devices in the global market. Electrode problems provoke an average of 20% of all repeated implantations, and also cause complications in patients such as vascular thrombosis, electrode infection, tricuspid valve dysfunction, heart failure, and an electrode entering the pericardial bag with the development of dangerous bleeding (cardiac tamponade). Thus, the problems of existing pacemaker technologies lead to additional costs in this area.

Despite the annual increase in the number of implanted pacemakers by 800-900 units, there is at least a 60% shortage of pacemakers in Russia, which indicates unsatisfactory supply of demand for implantable pacemakers of domestic production.

"The price of an imported pacemaker analogue is several times higher than the cost of domestic development, while imported pacemakers are implanted much less than domestic ones. This situation allows us to conclude that increasing the production of domestic models and introducing improved technologies is an urgent market requirement,"said Olga Bokeria, project manager.

Based on the results of the GenerationS acceleration program, the project team received a grant from the Innovation Support Fund in the amount of 2 million rubles under the Start program. The developers plan to use the grant to carry out R&D to finalize the pacemaker.

"Participation in the accelerator has played a big role in the development of the project and the company as a whole. As a part of the acceleration program, lectures, seminars, and master classes were held with the participation of speakers and mentors representing various areas of the business and the medical community. In addition, we were given a unique opportunity to meet with potential investors and customers, to establish contacts with new partners," said Olga Bokeria.

Now the project partners in Russia are the Scientific Center for Cardiovascular Surgery, the National Research University MIET and the implantable medical device supplier in Russia, IMPLANTA CJSC.

CONCLUSION

In recent years, it has been revealed that a violation of adequate atrial-ventricular synchronization and a violation of adequate interventricular synchronization are negative factors affecting the long-term results of a permanent CSD. Their main disadvantage is an increase in the chronic threshold of stimulation. The use of electrodes with a steroid coating in recent years has allowed to solve this problem.

The choice of indications for implantation of ECS requires a thorough analysis of cardiac arrhythmias and the clinical picture of the underlying disease in each individual patient. The goals of a constant ECS of patients hearts with arrhythmia are not only the preservation of the patient's life, but also the prevention of sudden cardiac death, the increase in life expectancy, the prevention of heart failure, thromboembolic complications, the treatment and prevention of LDCs, as well as the increase in working capacity and the quality of life of the patient.

Thus, a qualitative leap in the improvement of implantable devices has led to a significant expansion of their use and the emergence of new opportunities for electrotherapy.

Today, technological improvement of implantable devices allows clinicians to increasingly use the possibilities of electrotherapy in the treatment of both brady- and tachyarrhythmias, heart failure, as well as in primary and secondary prevention of sudden death. Regardless of the nature of the hemodynamically significant bradyssystole, the main task of a constant ES of the heart is to restore or maintain adequate atrial-ventricular synchronization.

REFERENCES

1. Golzari H. Atrial fibrillation: RESTORATION AND MAINTENANCE OF SINUS RHYTHM AND INDICATIONS // Journal. Rational pharmacotherapy in cardiology. 2016.
2. Zatonskaya E.V. EPIDEMIOLOGY OF ARRHYTHMES // Matyushin G.V., Gogolashvili N.G., Novgorodtseva N.Ya. Scientific reviews. 2016.
3. Kanorsky S.G. Modern pharmacotherapy of atrial fibrillation // Russian Journal of Cardiology. - 2017.
4. Miller O. N. Clinical recommendations and expert opinion on the use of antiarrhythmic drugs in real practice // A. V. Syrov, V. L. Doshchitsin, T. V. Pavlova, A. V. Tarasov. Consilium Medicum. 2019.
5. Skardenko Yu. P. Atrial fibrillation: current problems and prospects of medical support, treatment and prevention // A.V. Shustov, V.V. Zherebilov, N.A. Nikolaev. Russian Journal of Cardiology. - 2017.