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Vytryhovskyy Andriy Igorovuc
Ph. D. Med., State Higher Educational Establishment "Ivano-Frankivsk National Medical University» Faculty of Postgraduated Study, Ivano-Frankivsk Regional Cardiological Center Intensive Care Department, Mazepu Str 114, Ivano-Frankivsk 76000 Ukraine

Correspondence
Vytryhovskyy Andriy Igorovuc
Ph. D. Med., State Higher Educational Establishment "Ivano-Frankivsk National Medical University» Faculty of Postgraduated Study, Ivano-Frankivsk Regional Cardiological Center Intensive Care Department, Mazepu Str 114, Ivano-Frankivsk 76000 Ukraine

Optimization of prevention of life-dangerous arrhythmias and sudden cardiac death in postinfarction patients

Vytryhovskyy Andriy Igorovuc

Abstract
In many cases ventricular arrhythmia is the first in the gradual transformation of sudden cardiac death, but also a manifestation of fatal heart disease, so the main focus of studies in recent years World Cardiology is the search for markers of risk and ways to effectively prevent sudden cardiac death (SCD). Well studied electrocardiographic parameters which, are registered at Holter monitoring, such as the number, grading and ventricular morphology ectopias, fluctuations in the length of the QT interval are useful predictors of high risk in deciding on the expediency of primary prevention through RSD cardioverter-defibrillator implant or antiarrhythmic therapy. Existing today the selection criteria for primary prevention of sudden cardiac death of insufficient effective. Study on ECG measurements which are closely associated with ventricular ectopias, analysis of their relationship with the autonomic regulation provides the basis for new methods of diagnosis and treatment of risk-stratified markers. Physician should consider the state of the autonomic regulation of cardiac activity, when he choose the means of antiarrhythmics drugs, for its evaluation recently widely used spectral analysis and the variability of heart rate turbulence.

Keywords: postinfarction cardiosclerosis, ventricular fibrillation, sudden cardiac death, heart rate turbulence, heart rate variability

Introduction
Every year sudden death takes about 5 millions lives at our planet. According to the US Federal Committee annually SCD kills 450 thousands per year residents of the US (300 thousands in Europe), or 1 case per minute, or the number of victims of the terrorist act in 2000 in the World Trade Center every 2-3 days. The condition takes more lives than stroke, lung and breast cancer and AIDS combined. Among all the causes of death - 13% is sudden death, the structure of which 88% is sudden cardiac death. In 40% of patients sudden cardiac death occurs at home and 80% - during sleep. When we talk about the reasons- 80% of SCD- is coronary heart disease, 15% - cardiomyopathy, 5% - other reasons. The risk of sudden death in professional athletes is 3 times higher than the average person, and men 7 times higher than in women. In general, 0.3% of people in the general population have an innate predisposition to sudden death. (Gusak, 2009). According to the recommendations of the International Association of Cardiologists, antiarrhythmic the means is main component in the treatment of patients with ventricular ectopias and with high risk of sudden death (postinfarction patients who suffered clinical death or attacks of ventricular tachycardia, which have reduced ejection fraction, low tolerance to exercise, and low cardiac risk) [1, 6, 8, 12, 15, 17]. Early and frequent ventricular beats reduce coronary blood flow by 15-20% and 25-30% brain [13]. According to appoint antiarrhythmic a means, a doctor is to choose the most effective and safe drug. It should be noted that the incidence of sudden cardiac death has become in recent years one of the endpoints of controlled studies of drug efficacy and treatments of cardiac diseases, including coronary heart disease and heart failure [2, 9, 10]. Doctor should always take into account the state of the autonomic regulation of cardiac activity when he choose the antiarrhythmic means [7]. For its evaluation recently widely used spectral analysis and the variability of heart rate turbulence (HRV). Recently found that most antiarrhythmic means they are able to modify the state of the autonomic regulation of the cardiovascular system. So dizopyramid reduce power high-frequency component of heart rate variability, which indicates their cholinergic effects. Propanolol and other beta-blockers, by contrast, reduce tension very low frequency component of HRV and increase its high-voltage, which is typical for reducing the effects of sympathetic and parasympathetic gain. Some antiarrhythmics do not exercise

effects on the autonomic nervous system (Verapamil). The ability to modify the means antiarrhythmic effects on autonomic heart play a role in the implementation of proarrhythmogenics influence. Since the effectiveness of Indera, during ventricular arrhythmia, higher in patients with a predominance of sympathetic influences, under the influence of the treatment they have a decrease in sympathetic and parasympathetic increase. But the appointment of persons with Inderal moving forward parasympathetic parts of the autonomic nervous system autonomic imbalance observed strengthening that promotes arrythmogenics effects drug in 5% of patients. Antiarrhythmic action Ethacizin, etmozin, dizopiramid more pronounced in patients with a predominance of, parasympathetic tone) [16].

Table 1: The choice of antiarrhythmic drugs in patients with impaired heart rate depending on the individual cardiac autonomic regulation.

Option autonomic regulation	Criteria	Drug selection
The advantage of parasympathetic effects	The contribution to the overall voltage HF power range of 50%	Ethacizin, etmozin, dizopiramid
Normal value sympathetic and parasympathetic influences on heart	Contribution HF voltage range of the overall capacity of more than 30% to 50%	Verapamil, amiodarone, lidocain
The advantage of sympathetic influences	Contribution voltage LF and VLF power in the general range of 70%	Beta-blockers, amiodarone

When combined cardiac pathology with frequent ventricular arrhythmia high grade selects appropriate arrhythmic therapy. Drugs of choice are often ß-blockers, especially if indications: coronary heart disease, hypertension, synus arrhythmia. ß - blockers are the only group of drugs for drug prevention of sudden death in patients with acute myocardial infarction. (Frishman W.N., 1996). The high efficiency of these drugs is associated with antiarrhythmic and bradycardiac action. If necessary, ß-blockers to add antiarrhythmic drugs and class (propafenone, etmozyn, etacizin, dyzopiramid), subject to further feasibility application (Table 2).

Table 2: The feasibility of the use of ß - blockers for the prevention of sudden cardiac death

Recommendation patients	Type of prevention of sudden cardiac death
Undeniable benefits	after myocardial infarction, including patients with heart failure (primary) Symptomatic elongated interval syndrome QT (primary) Syndrome of prolonged QT- interval with an implanted cardioverter - defibrillator (secondary)
Evidence or expert opinion in favor of the use of ß – blockers	Postinfarction patients, resuscitated after ventricular tachycardia - ventricular fibrillation, ventricular tachycardia resistant spontaneous (secondary) Asymptomatic elongated interval syndrome QT (primary) Myocardial bridges (primary) cateholamin polymorphic ventricular tachycardia (primary and secondary)
Arguments in favor of the use of ß - blockers weaker	Arrhythmogenic dysplasia of the right ventricle (primary)
There is no reason to use	Hypertrophic Cardiomyopathy (primary)

Separately, I would draw attention to the emergence of a new marker of myocardial ischemia and, accordingly, a secondary occurrence of cardiac arrhythmias and sudden death - myocardial "bridges" consisting of fibro-muscular legs that cover epicardiac coronary arteries in different lengths. Myocardial "bridges" the data angiography occur in 0,5-4,5% of cases, often going lesions of the left anterior descending artery. The default display is angiographic systolic narrowing of blood vessels due to myocardial compression. Patients with myocardial presence "bridges" and clinical manifestations well to therapy ß- blockers. Effect of ß - blockers in this case due to the negative isotropic and chronotropic action. Nitrates increase the heart rate and can lead to the deterioration of patients. Seizures, leading to sudden cardiac death, often starting after strong physical exertion or emotional excitement or after in complete silence loud alarm included. Therefore, in order to avoid the influence of "triggering factors" triggers arrhythmias dangerous for life traditionally basic means of treatment QT-syndrome is ß- blockers in high doses [12]. There constant use can prevent syncopal episodes in 75% of cases. The disadvantage of ß -Blockers and verapamil is their relatively high activity during ventricular beats, a relatively higher rate of adverse effects with long term use. The advantage of them - the presence of anti-ischemic and anti-fibrylation action that ensures their high effectiveness in preventing sudden death in patients after myocardial infarction in the past. Ethatcizin advantage in its wide range of severe arrhythmogenic, fast action, with the possibility of receiving primary manifestations of heart failure, well tolerated during chronic administration, lack negative chronotropic effect (can receive in patients with bradycardia functional character). At the same time, remember that IP Division drugs may be arrhythmogenic effect in patients with coronary insufficiency in patients with postinfarction cardiomegaly, left ventricular aneurysm, low ejection fraction. The lack of effectiveness and ß -Blockers arrhythmic 1 class of drugs prescribed amiodarone - one of the most effective anti-arrhythmic drugs with the lowest probability of arrhythmogenic effects. Amiodarone is used for resistance to other antiarrhythmic drugs; besides, it is the drug of choice in patients with life-threatening arrhythmias and clinically pronounced against the backdrop of severe structural heart disease.

Amiodarone - the drug of choice for treatment and prevention of ventricular arrhythmias in patients with systolic dysfunction. The use of amiodarone in low doses (200 mg daily) can reduce to a minimum the number of non-cardiac side effects. Its main drawback - slow effect, negative effects on the lungs, thyroid, liver during chronic administration. An alternative treatment for patients with ventricular arrhythmias in the background of coronary heart disease is sotalol - antiarrhythmic drug with Class 3 ß -block properties. High efficiency amiodarone and sotalol in patients with malignant ventricular arrhythmias is not evidence of absence of security issues means antiarrhythmic drug class 3 lengthen the interval

corrected Q-T, which is safe limit of 440-460 ms. If the performance of the QT interval exceeds these limits, diagnose gained elongated interval syndrome QT. A typical and specific manifestation of tachycardia is polymorphic ventricular extrasistole (pirouette-tachycardia), which can be transformed into ventricular fibrillation. The risk of sotalol arrythmogenic action is greatest in the first 3 days of treatment. According to the Framingham Heart Study, ventricular beats can be of any debut with heart disease. If there beats against the background of signs of autonomic dysfunction sympathoadrenal activation, beta-blockers are shown and with the dominance of vago-insular symptoms-M-anticholinergics (atropine, belladonna preparations, itrop). If achieving sustainable sedative and antiarrhythmic effect daily dose for 6-7 days each reduced by a third to a full withdrawal. Patients with diseases of internal organs and especially arrhythmia requiring adequate treatment of the underlying disease.

Research methods

Given the results of many studies pivot, the experience of using antiarrhythmic the means, based on the results of the my own research, given the pathogenetic features appearances ventricular arrhythmia, and increase heart rate turbulence indicators and given the state of the autonomic regulation of cardiac activity was use. Two regimen patients with concomitant ventricular cardiosclerosis arrhythmia - standard (use ß1-selective blocker bisoprolol (bisoprolol-KRKA) and added to standard therapy phosphocreatine (neoton).

The aim of the study was to optimize the prophylactic treatment of coronary heart disease an existing phenomenon of heart rate turbulence based on a study of turbulence and variability of the heart by use beta-blocker (bisoprolol) and phosphocreatine (neoton). A sample of 100 patients who were hospitalized in the Ivano-Frankivsk regional clinical hospital with a diagnosis - ischemic heart disease, postinfarction cardiosclerousis complicated by heart rhyme type ventricular arrhythmia. Patients were divided into two groups receiving bisoprolol and the second to the above preparation was added phosphocreatine. The scheme of treatment was treatment - beta-blockers (bisoprolol) and phosphocreatine (neoton). Daily dose of bisoprolol was 0.07 mg/kg body weight, and phosphocreatine (neoton) 1 g treatment for 10 days. Table 3. presented changes in distribution of ventricular arrhythmia in patients with coronary heart disease. As shown in Table 3 in patients who underwent combined treatment bisoprolol and phosphocreatine were heavier patients - 59.08% of patients had ventricular lifedangerous extrasystols and 11.11% - was recorded early ventricular beats, V class for Lown. In the group which was administered only bisoproolol - the proportion of patients with lifedangerous arrhythmia was 49.95%. The number of patients with class I by Lown, was almost identical. With the II class for Lown- there was more to bisoprolol group. On the III class IV for Lown - almost the same class as the relative number of patients. Persons with class IV for Lown - group bisoprolol + neoton was not. In the context of the treatment of persons in the group bisoprolol in 11.11% of patients in ventricular beats was full reduction clinics and symptoms of arrhythmia. The number of patients with lifedangerous arrhythmia with 49.95% increase to 58.98%. The number of patients with class II - has not changed. And the number of patients with II class by Lown decreased twice. In addition to background bisoprolol + phosphocreatine in 54.54% of patients could achieve complete reduction of ventricular arrhythmia. The number of patients with life-dangerous arrhythmia decreased from 59.08% to 31.8%. Decreased number of patients by two times with II class by Lown, on the third - fallen from 40.9% to 22.72%. The next step was to establish a change of heart rate variability background of complex treatment of beta-blockers (bisoprol) and phosphocreatine (neoton) as shown in Table 3 complex therapy bisoprolol and neoton not led to significant reduction in the duration of interval QT. In active during the day stress index during treatment decreased by 16.68% which was not significant difference. The total voltage cardiac rhythm - in patients during treatment decreased to 4.19%. In the analysis of the value of individual spectra of heart rate variability found - HF range increased by 35,03%, LF- at 36.87% and the activity of the sympathetic nervous system, VLF range decreased - 13.57%. Relative subcortical activity of the sympathetic nervous center is not significantly increased by 14.0%. Centralization index increased significantly after treatment, 6.1%. In the passive stress during the day the index fell to the background of treatment and was opposed during night - at 14.89%. The value of the total voltage regulation body was not much night how to treat - the difference was 3.19%. After the comprehensive treatment and bisoprolol + neoton, the activity of the parasympathetic nervous system increase to 11.13%, vasomotor activity center increase to 35.55%, and activity of the sympathetic nervous systems- not decreased significantly - by 2, 84%. The relative activity of subcortical sympathetic nerve center during treatment decreased to 4.18%. Index of centralization fell only 0.02%.

In changing the parameters of heart rate turbulence, during treatment with bisoprolol and neoton observed a positive trend. Since the beginning of heart rate turbulence - decreased by 21.98%, a turbulence slope - down only 8.95%.

Table 3: The prevalence of ventricular arrhythmias during treatment (classification for Lown)

	I	II	III	IV	V	Without ventricular extrasystole
Bisoprolol, before treatment	6 (33,3%)	3 (16,6%)	8 (44,4%)	1 (5,55%)	0	-
Bisoprolol after treatment	3 (16,6%)	3 (16,6%)	9 (50%)	1 (5,55%)	0	2 (11,11%)
Bisoprolol + Neoton, before treatment	8 (36,36%)	1 (4,54%)	9 (40,9%)	0 (0%)	4 (18,18%)	-
Bisoprolol+Neoton, after treatment	4 (18,18%)	0 (0%)	5 (22,72%)	1 (4,54%)	1 (4,54%)	12 (54,54%)

Table 4: Dynamics of changes in variability and heart rate turbulence in patients with coronary heart disease in patients receiving bisoprolol and neoton, (M±m).

	QT, mc	QTc, mc	SI	TP, mc^2	HF%	LF%	HF, mc^2	LF, mc^2	VLF, mc^2	LF/HF	IC	To, %	Ts, mc/бит
Before Treatment (day)	381,94± 11,57	412,29± 6,45	76,64 ±4,89	4831,76± 1110,08	31,34± 2,66	68,64± 2,66	754,41± 346,93	1184,12 ±370,28	1672,52 ±265,87	2,57± 0,3	8,03± 1,28	-2,82 ±0,7	9,95± 2,04
After treatment (night)	376,35± 4,81	419,35± 5,89	63,94 ±16,8	4633,65± 1035,83	30,84± 3,86	69,17± 3,86	1018,17± 577,15	1620,65± 523,15	1445,17 ±238,58	2,93± 0,39	8,52± 1,18	-3,44 ± 0,64	9,06± 1,32

Before Treatment (day)	381,94± 11,57	412,29± 6,45	38,70 ±12,23	5736,23± 1185,72	31,38± 2,26	68,61± 2,26	1171,94± 456,12	1882,70± 522,62	2046,76 ±310,99	2,45± 0,23	7,41± 0,96	-2,82 ±0,7	9,95± 2,04
After treatment (night)	376,35± 4,81	419,35± 5,89	32,94 ±5,36	5553,23± 1159,73	34,22± 3,38	66,35± 3,41	1301,35± 660,24	1401,29± 292,41	1988,05 ±315,73	2,35± 0,28	7,44± 2,22	-3,44 ± 1,04	9,06± 1,32

Notes: [1]- difference $p < 0,01$ between before and after treatment

Discussion

Due to the resulting dynamics can be argued that self bisoprolol has expressed antiarrhythmic properties. Concerning the treatment of ventricular arrhythmia in patients with myocardial infarction transfer. In the treatment of bisoprolol and patients with phosphocreatine patients with myocardial infarction transfer cannot achieve complete reduction of ventricular ectopic activity in more than half of patients and significantly reduce the number of patients with ventricular life dangerous arryhmia. Analyzing changes of variability and turbulence heart rate we can say that adding to beta-blockers neoton, life dangerous arrhythmia allowed, maintain to physiological size activity of the autonomic nervous system and the vasomotor center and reduce early turbulence heart rate and maintain the value of slope turbulence heart rate at physiological norms.

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