International Heart and Vascular Disease Journal
Volume 3, Number 7, September 2015
Journal of the Cardioprogress Foundation

Comparative assessment of the effectiveness of radiofrequency ablation of pulmonary veins by the patients with persistent atrial fibrillation, effected in the course of coronary artery bypass grafting, depending on the renal function

Sysina O.N., Iskenderov B.G.*

Authors:
Olga N. Sysina, PhD, Head of the Nephrology and Urology Department, Penza Institute of Postgraduate Education, Penza, Russia;
Bakhram G. Iskenderov, MD, professor, Head of the Therapy and Functional diagnostics Department, Penza Institute of Postgraduate Education, Penza, Russia.

Abstract

Aim

To determine the effectiveness of radiofrequency ablation (RFA) with concomitant Coronary Artery Bypass Grafting (CABG) by the patients with persistent atrial fibrillation (AF) depending on the glomerular filtration rate (GFR).

Material and methods

403 patients (253 males and 150 females) aged from 50 to 67 (average age: 60.5±6.7 years) with persistent AF were examined. The duration of AF before an operation ranged from 1.5 to 8 years and on average 4.7±1.5 years. The initial figures of GFR accounted for from 59 to 45 ml/min/1.73 m^2 in 247 patients (the 1st group) and from 89 to 60 ml/min/1.73 m^2 in 156 patients (the 2nd group).

Results

During inpatient hospital period of CABG it was diagnosed Acute Kidney Injury (AKI) by the132 patients (53.4 %) in the 1st group and by the 35 patients (22.4 %) in the 2nd group. Early recurrences of AF were revealed by 43.3 % of patients in the 1st group and by 23.7 % of patients in the 2nd group (p<0.001). In the 1st group the diagnosis of early re-

* Corresponding author. Tel: +7906 399 5672. E-mail: iskenderovbg@mail.ru

currences of AF was made significantly more frequently among patients with AKI than among patients without it. 12 months after operation late recurrences of AF without antianginal therapy were revealed by 31.3 % of patients and among them by 37.8 % of patients with AKI in the 1st group; and by 21.2 % and 24.2 % respectively in the 2nd group. The figures of GFR were higher by patients with effective RFA than by patients with ineffective RFA on average at 37.8 % (p = 0.002). It was revealed that GFR directly correlates with an effective refractory period of the left atrium (r = 0.56; p < 0.001) and a frequency threshold for induction of arrhythmia (r = 0.53; p = 0.013). Elimination of paroxysms of AF after RFA procedure was followed by considerable improvement of morpho-functional and electrophysiological parameters of heart.

Conclusion

It was shown that the presence of renal dysfunction in patients with persistent AF adversely influences on effectiveness of RFA with concomitant CABG and a short- and long-term cardiovascular prognosis.

Key words

Renal dysfunction, coronary artery bypass graft surgery, radiofrequency ablation, atrial fibrillation.

Introduction

It is known that the atrial fibrillation (AF) belongs to the most common types of tachyarrhythmias, adversely influences the cardiovascular forecast, and demands the differentiated approach to therapy depending on types of AF [1, 2]. At present, for tactical control of sinus rhythm by patients with atrial fibrillation medications interventional and surgical techniques are successfully used [1, 3, 4]. Clarification reentry locations in the mouths of the pulmonary veins responsible for the occurrence of AF in 80–90 % of cases and the development of a method for mapping nonflyuroskopik charting created the preconditions for the widespread use of the procedure of isolation of the pulmonary veins and the ganglionic plexus with a view to effective control of sinus rhythm [3, 5]. Along with an intervention method of ablation the arrhythmogenic zones by patients with AF, in recent years it's often used a surgical ablation as simultaneous intervention in time of operation of the Coronary Artery Bypass Grafting (CABG) and/or heart valve replacement [6, 7]. Simultaneous heart operations allow to eliminate the causes of cardiovascular hemodynamic of AF, to influence most effectively on arrhythmogenic substrates, and also to isolate the left atrium as the most frequent source of intracardiac thrombosis and increased risk of cardioembolic stroke [1, 3].

It is shown that efficiency of a radiofrequency ablation (RFA) of mouths of pulmonary veins and plexus ganglion depends on the AF form — paroxysmal, persistent and permanent, frequency rates and ways RFA — surgical, transvenous, mono — and bipolar, etc., severity of cardiac remodeling, comorbidity index, and ranges from 50 % to 90 % [3, 4, 7, 8]. It is established that the risk of renewal of paroxysms of AF after the successful medicamentous and electric cardioversion depends on function of kidneys, i.e. on existence of a proteinuria and/or reduction of glomerular filtration rate (GFR) [9–11]. It is revealed that the chronic kidney disease (ChKD) correlates with the increased risk of emergence of AF and the thromboembolic complications [2, 12].

It is also known that existence of ChKD considerably increases risk of emergence of acute kidney injury (AKI) during the early period after heart operation, especially with application of artificial blood circulation [13, 14]. However opinions of experts on influence of AKI by patients with initial kidney dysfunction subjected CABG surgery in combination with RFA are diverged on the remote cardiorenal term. The researches devoted to an assessment of cumulative effect of ChKD and postoperative AKI by the patients with persistent AF subjected CABG in combination with RFA are single [7].

When assessing the prognostic role of ChKD by patients with HR it is necessary to consider dynamics of cardiovascular and kidney changes in the remote period after cardiac interventions in combination with RFA. As a rule, after operation CABG and/or prosthetics of valves of heart most of patients has an improvement the cardiac and real functions that positively affects the remote forecast and survival [8, 13]. Therefore, the assessment of dysfunction of kidneys by patients with AF before operation, and especially its dynamics after simultaneous heart operations is obviously important for forecasting of efficiency of RFA.

The aim of the study was to compare efficacy of GFR in combination with RFA by patients with persistent AF depending on GFR in the remote period after operation.

Material and methods

The clinical study included 403 patients, 253 men and 150 women aged 50–67 years (mean age — 60,5 ± 6,7 years) with persistent AF subjected to operation CABG in combination with RFA of pulmonary veins in the Penza federal center of cardiovascular surgery. By 221 (89.5%) patients during operation it was performed isolation of the left atrial appendage to prevent cardioembolic stroke in case of resumption of recurrent AF.

Prescription AF before operation mad up from 1.5 to 8 years and the average — 4.5 ± 1.6 years (Table 1). Paroxysms of AF recurred from 2 to 7 times a year and generally stopped using antiarrhythmic drugs. The initial sizes of GFR determined by a formula CKD-EPI [15] by 247 patients made up from 59 to 45 ml/min. / 1,73 sq.m (1 group) and by 156 patients — from 89 to 60 ml/min. / 1.73 sq.m (the 2nd group). AKI was diagnosed and classified by creatinine level in blood serum, using criteria of AKIN (Acute Kidney Injury Net-work) [16].

The comparison of the clinical and anamnestic data revealed prevalence of comorbid states in 1 group on comparison with the 2nd group — the postponed myocardial infarction (p=0.027) and a stroke (p=0.025), chronic heart failure of stagnant type (p=0.011), anemia (p=0.039) and obesity (p=0.036). Besides, in 1 group the frequency of paroxysms of AF (p=0.003) and their duration (p=0.011) was more, than in the 2nd group.

Criteria for an exception from research were: primary diseases of kidneys; diabetes of 2 types; carrying out a program hemodialysis before operation; sick sinus syndrome and/or atrioventricular block of the II–III degree; valvular heart disease; thyroid disease with violation of hormonal activity.

Doppler echocardiography was carried out on the device Acuson X300 ("Siemens-Acuson", Germany) at a sinus rhythm. It was determined the final diastolic and final systolic sizes of the left ventricle (FDSLV, FSSLV), an index of the volume of the left atrium (IVLA), the ejection fraction (EF) of LV, cardiac index (CI) LV, myocardial mass index LV (MMI) and specific peripheral vascular resistance (SPVR). For an assessment of LV diastolic function it was defined indicators of a transmitral diastolic flow: maximum speed of a fast and slow blood supply (Ve, Va); their ratio (Ve/Va); isovolumic relaxation time of LV (IVRT), and also it was calculated the Cardiothoracic ratio (CRCR).

Electrophysiological research of heart was conducted by transesophageal electrical stimulation of the left atrium. It was calculated the following indicators: wave dispersion of P (dP); recovery time of sinus node function (RTSNF); corrected DACE (RACE); effective refractory period of the left atrium (ERPLA); frequency threshold of induction of arrhythmia (FTIA). Holter monitoring of the electrocardiogram was carried out by means of Astrocard system ("Meditek", Russia) for the purpose of identification of violations of a warm rhythm, including asymptomatic and unstable paroxysms of AF (duration < 30 sec.). Tool researches were conducted before, in 6 and 12 months after operation.

Table 1. **The clinical characteristic of the examined patients in groups before operation**

Options	1group (n=247)	2 group (n=156)
Men, n / %	156 / 63.2	97 / 62.2
Age, years (M±SD)	60.5±6.7	61.6±6.3
Prescription AF years (M±SD)	4.7±1.5	4.3±1.2
The frequency of paroxysmal AF per year (M±SD)	4.49±1.38	3.62±1.16*
Heart rate during AF in minute. AF (M±SD)	130.7±11.5	129.1±10.2
Duration paroxysm AF, hours (M±SD)	6.28±1.76	4.81±1.46*
CHF II–III functional class, n / %	102 / 41.3	44 / 28.2*
Arterial hypertension, n / %	147 / 60.5	83 / 53.2
Myocardial infarction, n / %	106 / 43.6	49 / 31.4*
previous stroke, n / %	35 / 14.2	10 / 6.4*
Anemia (Hb < 110 г/л), n / %	29 / 11.7	8 / 5.1*
GFR ml / min/1,73 м^2 (M±SD)	54.3±4.4	72.9±6.1*
abdominal obesity, n / %	103 / 41.7	48 / 30.8*
Chronic obstructive pulmonary disease, n / %	18 / 7.3	18 / 7.3

Note: ur — unreliable (p>0,05). CHF — congestive heart failure; HR — heart rate; Hb — hemoglobin.

Research was carried out according to standards of appropriate clinical practice (Good Clinical Practice) and the principles of the Helsinki Declaration of the World medical association. The protocol of research was approved by Ethical committee of the institute and before inclusion in research patients signed the written informed consent.

Statistical processing of results of research was carried out with application of the Statistic 6.0 program. The normality of distribution of signs was determined by Kolmogorov-Smirnov's test. Depending on nature of distribution of signs reliability of distinctions was defined by means of parametrical (Styudent's t-criterion) and nonparametric methods (Mann-Whitney's U-criterion). Comparison of frequencies of a binary sign was carried out by definition of nonparametric criterion χ^2 according to Pearson. Conjugacy of the studied parameters determined by method of the one-factorial correlation analysis by Pearson. Data were presented in the form by M±SD. Distinctions were considered reliable at $p < 0.05$.

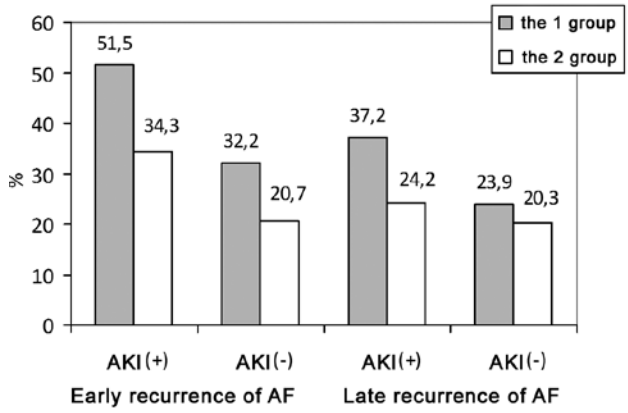
Results

During the hospital period of supervision after operation it was diagnosed AKI for 167 patients, including in the 1 group — by 132 (53.4%) patients and in the 2nd group — by 35 (22.4%) patients. As a result, in each group allocated two subgroups: patients with AKI and without it. It should be noted that in the next 30 days after operation early recurrence of AF in 1 group was revealed by 107 (43.3%) patients and in the 2nd group — by 37 (23.7%) patients, distinction is reliable (χ^2=15.16; p <0.001). Besides, in the 1 group with AKI early recurrence of AF was diagnosed for patients authentically more often (χ^2=7.05; p=0.008), than by the patients who don't have AKI (figure 1). Early recurrence of AF by the patients who don't have AKI was authentically more often in 1 group, than in the 2nd group: 33,9% vs 20.7% (χ^2=4.59; p=0.032).

The assessment of efficiency of RFA in 12 months after operation has showed that in the 1 group late recurrence of AF without application of antianginal therapy is diagnosed by 71 (31.1%) of the patient and in the 2nd group — by 32 (21.2%) of patients. Thus in the 1 group the number of the patients who transferred AKI was reliable more, than patients without AKI: 37.8% vs 23.9% (p=0.033). Besides this, the probability of emergence of late recurrence of AF by patients without AKI authentically didn't differ depending on initial function of kidneys.

By the end of the supervision period in the 1 group efficiency of RFA without application of AAT made 68.9% and in combination with AAT — 80.7%, in the 2nd group — 79.5% and 90.1%, respectively. Thus, the patients who transferred AKI, had an efficiency of RFA below, than at the patients who didn't have postoperative AKI. Without AAT, patients of the 1 group which transferred AKI had the minimum direct efficiency of RFA and made up 62.2%, and maximum efficiency took place by the patients without dysfunction of kidneys, both before operation, and after it, made up 80.5% (χ^2=9.10; p=0.003).

When **s**tudying relationships of cause and effect between early and late recurrence of AF after operation distinction in the compared groups has been revealed. It is shown that in the 1 group by the patients with AKI and with early recurrence of AF the probability of preservation of recurrence of AF and in the late period after operation is high: in 51.1% of cases. However patients without AKI have a preservation of recurrence of AF, which arose in the early postoperative period, it was observed by 42.3% of patients. In the 2nd group in the presence



Note: AKI (+) — patients with AKI; AKI (-) — patients without AKI.

Figure 1. Comparison of efficiency of RFA depending on the initial function of kidneys and development of postoperative AKI without application of AAT

of early recurrence of AF by the patients who transferred AKI, arrhythmia paroxysms in 12 months after operation were noted in 37.5% of cases and by the patients without AKI — in 33,3% of cases. It testifies that existence of early recurrence of AF after operation CABG in combination with RFA does not exclude possibility of preservation of a stable sinus rhythm in the remote period.

It should be noted that patients with early recurrence of AF have cardiovascular complications — a perioperative myocardial infarction, an ischemic stroke, a sharp heart and renal failure, etc., took place authentically more often than at preservation of a sinus rhythm. The hospital lethality depending on initial function of kidneys and development of AKI fluctuated from 9.8% to 2.5%.

It should be noted that in 12 months after operation CABG in combination with RFA in the 1 group by 21 (9.2%) of the patient, including by 14 (11.8%) of the patients who transferred AKI progressing of the dysfunction of kidneys preceding operation and in the 2nd group — 3.3% and 6.1%, respectively took place. The stable increase in GFR in 12 months after operation in the 1 group it was observed by 117 (51.3%) of the patients, including by 48 (40.3%) of the patients who transferred AKI and in the 2nd group — 60,9% and 54.6% respectively. As a result, in 12 months after operation from 379 patients by 263 (69.4%) the size of GFR was->60 ml/min. / 1.73 in sq.m and by 116 (30.6%) of the patients it was <60 ml/min. / 1.73 sq.m. It is also shown that efficiency of RFA at size GFR > 60 ml/min. / 1.73 sq.m in comparison with GFR <60 ml/min. / 1.73 sq.m are reliable above (figure 2): 74.1% and 57.8% respectively (p=0.011). It is revealed that by the patients from successful RFA the size of

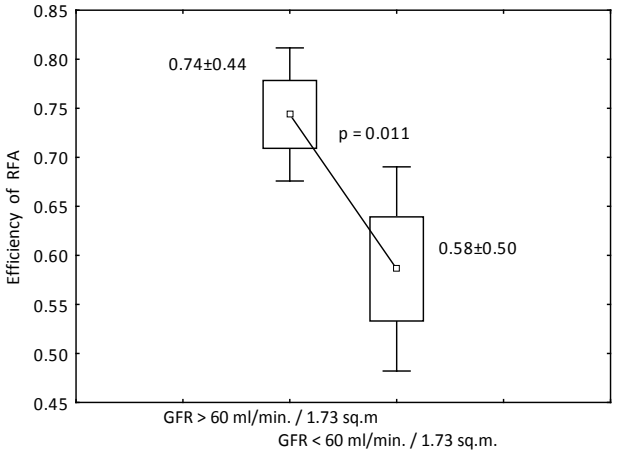


Figure 2. Efficiency Comparison of RFA depending on size of GFR in 12 months after operation

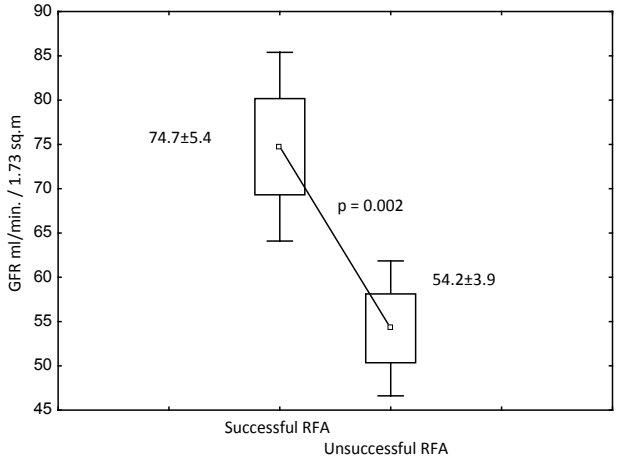


Figure 3. Comparison of Sizes GFR depending on efficiency of RFA

GFR in average for 37.8% (p = 0.002) surpasses that by the patients from unsuccessful RFA (figure 3).

By means of the one-factorial correlation analysis the correlations of GFR and electrophysiological indicators of heart testifying that decrease in GFR of kidneys is associated with factors of electric heterogeneity of atrial– violation of diastolic relaxation of ventricles, dilatation of the sizes of atrials, anemia, etc. [1, 17] are revealed. It is shown (figure 4) that size GFR directly correlates with indicators ERPLA (r = 0.56; p <0.001) and FThIA (r = 0.53; p = 0.013).

Comparison initial of the morpho-functional and electrophysiological parameters of heart depending on efficiency of RFA didn't reveal the distinction (table 2). However, 12 months later after operation it is noted that elimination of paroxysms of AF leads to improvement of parameters of cardiohemodynamics, and also to reduction of cardiometric parameters. Thus indicators of systolic function — CI and

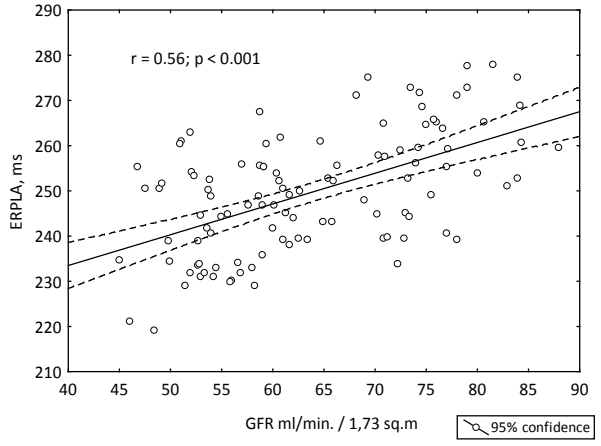


Figure 4. Correlation of Indicators GFR and ERPLA irrespective of initial function of kidneys

EF increased in average by 13.9% (p=0.008) and 16.9% (p=0.026), respectively, indicators of the diastolic function LV —Ve/Va and IVRT also changed authentically: in average for 32.6% (p<0.001) and 9.0%

Table 2. **Comparison of dynamics of the morpho-functional and electrophysiological parameters of the heart in 12 months after operation taking into account efficiency of RFA (M±SD)**

Indicators	Patients with successful RFA (n = 320)			Patients with unsuccessful RFA (n = 59)		
	Initially,	After operation	p	Initially,	After operation	p
EDSLV, mm	55.4±4.7	51.8±5.1	ur	54.9±4.2	53.0±5.2	ur
VILA, ml/m^2	42.7±3.6	34.5±4.3	0.014	43.2±4.0	38.6±3.2*	0.031
EF LV, %	46.7±4.1	54.6±5.2	0.026	47.1±3.8	50.3±5.0*	ur
CI, l/min/m^2	2.38±0.19	2.71±0.23	0.008	2.35±0.21	2.54±0.26*	0.014
SPVR, conventional units.	55.0±6.4	43.0±5.5	<0.001	54.6±5.9	47.0±6.1	0.011
ILVM, g/m^2	118.3±12.7	108.2±11.6	0.029	117.4±13.2	114.5±12.3	ur
CR, %	44.3±5.0	39.6±4.7	0.032	44.5±5.6	41.7±3.8	ur
Ve / Va	0.86±0.07	1.14±0.13	<0.001	0.85±0.09	1.03±0.12*	0.006
IVRT, ms	101.5±9.7	92.4±10.6	0.011	102.6±9.4	96.5±8.3	ur
КВВФСУ, **ms**	290.8±22.5	245.1±18.3	ur	318.0±27.6	263.1±30.2	ur
ERPLA, ms	235.2±18.1	276.4±23.9	0.008	241.6±20.3	255.4 ±24.9*	0.031
FThIA, impulse/min	477.0±63.2	822.5±74.3	<0.001	485.1±70.6	608.5±56.0*	0.022
Wave dispersion P, vc	41.8±3.9	35.4±3.5	0.036	42.3±4.5	40.2±4.8	ur

Note: * — distinction of indicators after operation in groups, ur — unreliable (p<0,05).

(p=0.011), respectively. It is important to note that stable preservation of a sinus rhythm, improvement of contractile and pump function of the heart, thanks to successful RFA and a revascularization of a myocardium, promoted reduction of the increased initial sizes of heart — EDSLV, CR, VILA and ILVM. In group of patients with successful RFA indicators ERPLA and FThIA increased in average in 17.5 % and in 1.72 times, respectively, and wave dispersion P decreased in average in 15.3 % (p = 0.036).

In the group of patients with unsuccessful RFA the changes in morphological and functional indicators of heart were also reliable, but are less expressed, than by the patients with successful RFA. Despite preservation of rare paroxysms of AF after RFA and against AAT, the frequency of waves of fibrillation (f waves) and HR during a paroxysm of AF decreased authentically, indicators ERPLA, FThIA and amplitude of waves, contrary, increased. By most of patients with successful RFA it wasn't succeeded to induce AF paroxysms by means of transesophageal electrostimulation, or unstable paroxysms were induced.

It is important to note that existence of dysfunction of kidneys by patients with persistent AF both in an initial state, and after operation CABG in combination with RFA influences risk of development of adverse cardiovascular events, mortality and a further current of an arhythmic syndrome. It is shown that within the first year of supervision cardiovascular complications after successful RFA arose less than at patients with late recurrence of AF (table 3). Repeat of paroxysms of AF after operation was followed by the increased need for implantation of a pacemaker, a program hemodialysis and reception of indirect anticoagulants. Annual mortality after discharge from a hospital in group of the patients with successful RFA was authentically higher (p=0.019), than at preservation of recurrence of AF after RFA.

Table 3. **Comparison of clinical outcomes depending on efficiency of RFA in combination with CABG 12 months later after operation (n/%)**

Cardiovascular complications and manipulations	Patients with successful RFA (n = 320)	Patients with unsuccessful RFA (n = 59)
Acute coronary syndrome / myocardial infarction	7 / 2.19	4 / 6.78
Ischemic stroke / transient ischemic attack	4 / 1.25	5 / 8.48*
The manifestation of sick sinus syndrome	6 / 1.88	3 / 5.08
Long persistent / permanent AF	0/0	7 / 11.86*
Pacemaker implantation	7 / 2.19	3 / 5.08
The frequency of hospitalization for cardiac causes (M±SD)	0.46±0.48	1.13±0.52*
Percutaneous coronary interventions	5 / 1.56	4 / 6.78
Thrombosis / embolism	3 / 0.94	2 / 3.39
Cardiovascular mortality	6 / 1.88	5 / 8.48*
Program hemodialysis	0 / 0	4 / 6.78*

Note: * — distinction between groups (p < 0,05).

Thus, existence of ChKD with the lowered GFR <60 ml/min. / 1.73 sq.m by the patients with persistent AF subjected to operation of CABG in combination with RFA is associated with low efficiency of RFA procedure in comparison with intact function of kidneys, and also adversely influences cardiovascular and renal forecasts.

Discussion

In recent years in connection with the steady growth of frequency of identification of ChKD in the general population the study of cardiorenal relationship becomes relevant, characterized cardiorenal syndrome and cardiorenal continuum. It is proved that existence of the dysfunction of kidneys, which is shown a proteinuria and/or decrease in GFR increases risk of emergence of AF, reduces efficiency of medicamentous control of a sinus rhythm [10–14, 18]. Results of the conducted research showed that efficiency of the RFA procedure executed during operation of CABG depend not only on an initial functional condition of kidneys, but also more depend on postoperative dynamics of ChKD. It is shown, that at patients with successful RFA the preservation of a stable sinus rhythm promotes increase of cardio hemodynamic effectiveness of CABG, in its turn, improvement of contractile and pump function of the heart by revascularization within optimizes renal hemodynamics and glomerular filtration.

It is important, that postoperative dynamics of morpho-functional heart remodeling correlates with the effectiveness of RFA. Preservation of a stable sinus rhythm in 12 months. after CABG in combination with RFA is associated with regression of left ventricular hypertrophy of LV, improvement of indicators of systolic and diastolic functions of heart and reduction of the sizes of the left ventricular which in total reduce "arrhythmogenic potential" atria. Several authors emphasized the prognostic value of baseline morphological and functional indicators in assessing the effectiveness of the procedure RFA by patients with the AF various forms [2, 6, 7]. It is shown, that initial morpho-functional and electrophysiological risk factors for late recurrence of AF correlate with inefficiency RFA procedure, on the contrary, by pa-

tients with a successful outcome of RFA postoperative values of these parameters play an important role regardless of the dynamics of the initial parameters. It means that, based on initial morphological and functional parameters of the heart one can not conclusively predict the efficacy of RFA, especially, carry out profiling of patients to which this procedure can be refused.

It is also revealed, that effective RFA is followed by reliable shifts of the electrophysiological indicators characterizing electric characterized by an electrical heterogeneity ("arrhythmogenic readiness") of the atria. It is shown, that in the group of patients with lack of late recurrence of AF the reliable increase in presurgical indicators ERPLA and FThIA is noted. Despite of preservation of recurrence of AF after RFA, it's often marked the reduction of expressiveness of clinical and hemodynamics symptomatology of AF that is shown by reliable reduction of frequency and duration of paroxysms of AF, increase in the specific frequency of asymptomatic paroxysmal AF. Therefore, morpho-functional indicators of heart, and the lowered GFR of kidneys before operation of CABG in combination with RFA in comparison with their postoperative values possess less expressed predictive value of efficiency of surgical RFA in the remote period.

It is also noted, that the development of postoperative AKI is followed by increase in frequency of early recurrence of AF, and adversely influences the next cardiovascular forecast irrespective of initial size of GFR. Efficiency of RFA in combination with operation of CABG and the cardiovascular forecast during the remote period is much worse by the patients who transferred AKI and by initial dysfunction of kidneys.

Therefore, absence of full antiarrhytmic effect dictates the need to perform repeated procedures of RFA, including expansions potential the arrhythmogenic sites, which are exposed to ablative effects, and eliminating postincisional supraventricular tachycardia [6, 7].

Thus, the importance of the received results consists in that the predictive value of decrease in GFR <60 ml/min. / 1,73 sq.m both before operation, so after CABG in combination with RFA in the remote period. In this regard holding cardio- and neuroprotective therapy, including use of a program hemodialysis is actual. It is revealed that the improvement of glomerular function of kidneys, thanks to simultaneous operation of CABG and the RFA procedure, promotes improvement of the cardiovascular forecast.

Conclusions

Early recurrence of AF after operation of CABG in combination with RFA appears at initial size of GFR < 60 ml/min. / 1,73 sq.m and in case of development of postoperative AKI, than by the patients with size of GFR > 60 ml/min. / 1,73 sq.m and in the absence of AKI authentically more often.

Efficiency of the single procedure of RFA in combination with CABG and without application of antiarrhytmic therapy, in 12 months after operation by the patients with size of GFR < 60 ml/min. / 1.73 sq.m, made up 68,9 %, including by the patients who transferred postoperative AKI, – 62.2 % and by patients with size of GFR > 60 ml/min. / 1.73 sq.m — 79.5 % and 75.8 %, respectively, in a combination with AAT – 80.7 and 90.1 %, respectively.

Size of GFR irrespective of dysfunction of kidneys directly correlates with indicators of the effective refractory period of the left ventricle (r=0.56; p < 0.001) and frequency threshold of induction of AF (r=0.53; p=0.013). By the patients with successful RFA the size of GFR reliable above in average for 37.8 % (p=0.002), than by the patients with unsuccessful RFA.

Conflict of interest: None declared.

References

1. Camm AJ, Kirchhof P, Lip GY, et al. Guidelines for the management of atrial fibrillation. The Task Force for the Management of Atrial Fibrillation of the European Society of Cardiology. Eur Heart J. 2010;31:2369–429.
2. Fomin VV, Kiyakbaev GG. Chronic kidney disease and atrial fibrillation. Klinicheskaya nefrologiya. 2010;6:34–8. Russian (Fomin V.V, Kiyakbaev G.G. Chronic kidney disease and atrial fibrillation. Clinical Nephrology. 2010;6:34–8).
3. Bokeriya LA, Revishvili ASh. Modern approaches to nonpharmacological treatment of atrial fibrillation. Vestnik aritmologii. 2006;45:5–18. Russian (Bokeria L.A, Revishvili A.Sh. Modern approaches to pharmacological treatment of atrial fibrillation. Bulletin of arrhythmology. 2006;45:5–18).
4. Willems S, Drewitz I, Steven D, et al. Interventional therapy of atrial fibrillation: possibilities and limitations. Dtsch Med Wochenschr. 2010;135 (Suppl 2): 48–54.
5. Beukema WP, Sie HT, Misier AR, et al. Predictive factors of sustained sinus rhythm and recurrent atrial fibrillation after a radiofrequency modified Maze procedure. Eur J Cardiothorac Surg. 2008;34 (4): 771–5.
6. Veasey RA, Segal OR, Large JK, et al. The efficacy of intraoperative atrial radiofrequency ablation for atrial fibrillation during concomitant cardiac surgery: the Surgical Atrial Fibrillation

Suppression (SAFS) Study. J Interv Card Electrophysiol. 2011;32 (1):29–35.

7. Naruse Y, Tada H, Sekiguchi Y, et al. Concomitant chronic kidney disease increases the recurrence of atrial fibrillation after catheter ablation of atrial fibrillation: a mid-term follow-up. Heart Rhythm. 2011;8:335–41.
8. Mainigi SK, Sauer WH, Cooper JM, et al. Incidence and predictors of very late recurrence of atrial fibrillation after ablation. J Cardiovasc Electrophysiol. 2007;18 (1):69–74.
9. Sandhu RK, Kurth T, Conen D, et al. Relation of renal function to risk for incident atrial fibrillation in women. Am J Cardiol. 2012;109:538–42.
10. Alonso A, Lopez FL, Matsushita K, et al. Chronic kidney disease is associated with the incidence of atrial fibrillation: the Atherosclerosis Risk in Communities (ARIC) study. Circulation. 2011;123:2946–53.
11. Soliman EZ, Prineas RJ, Go AS, et al. Chronic Renal Insufficiency Cohort (CRIC) Study Group. Chronic kidney disease and prevalent atrial fibrillation: the Chronic Renal Insufficiency Cohort (CRIC). Am Heart J. 2010;159 (6):1102–7.
12. Go AS, Fang MC, Udaltsova N, et al. Impact of proteinuria and glomerular filtration rate on risk of thromboembolism in atrial fibrillation: the anticoagulation and risk factors in atrial fibrillation (ATRIA) study. Circulation. 2009;119(10):1363–9.
13. Charytan DM, Yang SS, McGurk S, Rawn J. Long and short-term outcomes following coronary artery bypass grafting in patients with and without chronic kidney disease. Nephrol Dial Transplant. 2010;25:3654–63.
14. Iskenderov BG, Sisina ON. Risk factors and outcomes of acute kidney injury in patients with intact renal underwent coronary artery bypass grafting. Nefrologiya. 2013;4:63–7. Russian (Iskenderov B.G., Cicinho O.N. Risk factors and outcomes of acute kidney injury by patients with preserved renal function undergoing coronary artery bypass surgery. Nephrology.2013;4:63–7).
15. Kidney Disease: Improving Global Outcomes (KDIGO) CKD Work Group. KDIGO 2012 clinical practice guideline for the evaluation and management of chronic kidney disease. Kidney Int Suppl 2013;3(1):1–150.
16. Smirnov AV, Kayukov IG, Degtereva OA, et al. Problems of diagnostics and stratification of burden of acute kidney injury. Nefrologiya. 2009;3:9–18.
17. Iskenderov BG, Rakhmatullov FK. Structural and electrophysiological predictors of paroxysmal atrial fibrillation. Rossiyskiy kardiologicheskiy zhurnal 2014;4:86–91. Russian (Iskenderov BG, Rahmatullah FK Structural and electrophysiological predictors of paroxysmal atrial fibrillation. Russian Journal of Cardiology. 2001;4:26–30).
18. Iguchi Y, Kimura K, Kobayashi K, et al. Relation of atrial fibrillation to glomerular filtration rate. Am J Cardiol. 2008;102 (8): 1056–9.