Eshmatov O.R., Batalov R.E., Archakov E.A., Usenkov S.Yu., Popov S.V.
Research Institute of Cardiology, Tomsk National Research Medical Center of the Russian Academy of Sciences, Tomsk, Russia

Efficacy and Safety of Anticoagulant Therapy in Patients With Various Forms of Atrial Fibrillation After Interventional Treatment. Results of a Three-Year Follow-up

Aim	To evaluate efficacy and safety of the anticoagulant therapy in patients with atrial fibrillation (AF) during a 36-month follow-up after an interventional treatment.
Material and methods	This study included 302 patients aged 29 to 81 years with various forms of AF. Catheter ablation (CA) of AF foci was performed for all patients. The patients were divided into 3 groups: group 1 with paroxysmal AF, group 2 with persistent AF, and group 3 with longstanding persistent AF. Two subgroups were isolated in each group, with effective and ineffective CA. Results of the follow-up were analyzed at 12, 24, and 36 months after discharge from the hospital. The follow-up interview recorded complaints of palpitation attacks, effectiveness of administered CA, compliance with the treatment, adverse clinical outcomes, including thromboembolic complications (TEC), bleeding, and hospitalizations.
Results	Efficacy of the interventional treatment for 36 months was 65.3% in patients with paroxysmal AF, 59.7% in patients with persistent AF, and 57.1% in patients with longstanding persistent AF. Patients with paroxysmal AF and effective CA had no adverse events throughout the same period during the antithrombotic treatment (ATT). In contrast, the group with ineffective ablation had both TEC and hemorrhagic complications during the ATT. In the group with persistent AF and effective CA throughout the follow-up period, TECs were less frequent than in the group of ineffective ablations during the ATT treatment. Patients with longstanding persistent AF and effective CA throughout the follow-up period, had no TECs in contrast to patients with ineffective ablation during the ATT treatment. There were no fatal outcomes in patients with effective procedure.
Conclusion	A successful CA procedure for AF provides a significant decrease in the risk of ischemic stroke. Furthermore, the invasive strategy does not increase the risk of major and minor bleedings.

Keywords	Atrial fibrillation; catheter ablation; anticoagulant therapy
For citations	Eshmatov O.R., Batalov R.E., Archakov E.A., Usenkov S.Yu., Popov S.V. Efficacy and Safety of Anticoagulant Therapy in Patients With Various Forms of Atrial Fibrillation After Interventional Treatment. Results of a Three-Year Follow-up. Kardiologiia. 2022;62(8):19–26. [Russian: Эшматов О.Р., Баталов Р.Е., Арчаков Е.А., Усенков С.Ю., Попов С.В. Эффективность и безопасность антикоагулянтной терапии у пациентов с различными формами фибрилляции предсердий после интервенционного лечения. Результаты трехлетнего наблюдения. Кардиология. 2022;62(8):19–26].

Corresponding Author	Eshmatov O.R. Email: atabek_eshmatov@mail.ru

Introduction

Atrial fibrillation (AF) is one of the most common heart rhythm disorders that can result in worse circulatory dynamics, and thus reduce exercise tolerance and the quality of life as a whole [1]. AF is not a life-threatening arrhythmia, however, according to Benjamin et al., it doubles mortality in cardiac patients [2]. The clinical significance of AF is mainly the increased risk of stroke and the progression of CHF. In this regard, the prevention of thromboembolic events (TEE) is currently one of the most important aspects of managing patients with AF regardless of the form of arrhythmia and is based on the assessment of TEE risk using the Cha2DS2 VASc score [3]. A lot of relevant literature data are available. In particular, dabigatran, rivaroxaban, and apixaban were shown in clinical studies, such as RE-LY, ROCKET-AF, and ARISTOTLE, to be more effective and safer than warfarin for the prevention of TEEs in patients with AF [4–6]. However, there are only few studies that evaluate the development of cardiovascular complications during anticoagulant therapy in combination with catheter ablation (CA) of AF foci. One of the main methods for maintaining sinus rhythm, radiofrequency ablation (RFA) is aimed at eliminating AF, i.e., the cause of left atrial (LA) thrombosis. Thus, effective CA should reduce the incidence of ischemic cerebral and vascular complications, the onset of CHF, and prevent a reduction in the quality of life due to arrhythmia.

Objective

Evaluate the efficacy and safety of anticoagulant therapy in patients with AF during the 36-month follow-up after intervention treatment.

Material and Methods

The study included 302 patients, among them 171 (56.6%) were male, from 29 to 81 years old (median age 60.0 [53; 66] years) with various forms of AF, who were treated at the Research Institute of Cardiology of the Tomsk National Research Medical Center in the period from 01.01.2017 to 31.12.2018.

The inclusion criteria were age over 18 years, documented AF, and performed CA. Patients were divided to three groups: Group 1 included 75 (24.8 %) patients with paroxysmal AF; Group 2 included 164 (54.4 %) patients with persistent AF; Group 3 included 63 (20.8 %) patients with long-term persistent AF. Each group included two subgroups: patients with a history of effective CA and CA failure.

This single-center cohort retrospective observational study was conducted following the Good Clinical Practice and the Declaration of Helsinki and approved by the Ethics Committee of the Institute of Cardiology. All patients signed the informed consent to be included in the trial.

Analysis of antithrombotic therapy (ATT) showed that 50 (16.5%) patients did not receive ATT at the time of hospitalization, more than 50 % of them had a Cha2DS2 VASc score >2 (Table 1), 24 (7.9%) patients took acetylsalicylic acid (ASA) with a mean Cha2DS2 VASc score of 2. Of the 86 (28.4 %) patients taking warfarin, only 20 (23.3 %) patients achieved the target international normalized ratio (INR).

Radiofrequency isolation of pulmonary veins (PV) was carried out in 159 (52.6 %) patients; expanded intervention including PV isolation and linear ablation along the LA posterior wall, roof, and mitral isthmus in 134 (44.4%) patients and cryoballon isolation of PV in 9 (3.0 %) patients.

Complications were detected in 8 (2.6%) patients in the postoperative period: hemopericardium, which required evacuation of blood, in 3 (1.0%) patients, and a false aneurysm at the puncture site, which did not require surgery, in 5 (1.6%).

Antiarrhythmic therapy (AAT) and ATT were prescribed in accordance with the indications to all patients at discharge.

The choice between warfarin and direct oral anticoagulants (DOAC) was made considering patient's wishes (financial means, regular INR monitoring). Patients who took DOACs before hospitalization continued therapy.

Observation data were analyzed at in 12, 24, and 36 months after initial discharge from the hospital. The control survey included complaints of palpitations, documented recurrence of arrhythmia, efficacy of CA, adherence to the prescribed treatment, unfavorable clinical outcomes, such as TEEs and bleeding, and hospitalizations. The efficacy endpoints of ATT, depending on the success of AF CA, were cardiovascular complications, myocardial infarction (MI), ischemic acute cerebrovascular accident (CVA) and other TEEs, thrombosis of cardiac cavities and lower extremity veins. The safety endpoints were bleeding, major and minor according to the classification [7].

Laboratory tests and clinical examinations included 12-lead electrocardiography (ECG), Holter ECG monitoring, transthoracic echocardiography (TTE), coronary angiography, and clinical and biochemical blood tests. All patients underwent transesophageal echocardiography (TEE) before CA to assess the presence of thrombotic masses in the heart cavities, and LA appendage ejection velocity. TEE was performed using the Philips Envisor ultrasound system. All patients were assessed for the risk of developing TEEs, bleeding, AF-related symptoms, using the Cha2DS2 VASc, HAS-BLED, and EHRA scores.

The data obtained were processed using Statistica 12.0. Continuous variables are expressed as M ± SE, where M is a sample mean and SE is a standard error of mean. Non-normally distributed variables are represented as Me [Q1; Q3], where Me is a median, Q1 and Q3 are the first and third quartiles. The categorical indicators are presented as rates and percentages. The means were compared using the Student's t-test. The categorical indicators were compared using the Pearson's chi-squared; the Yates' continuity correction was used in the case of low rates (more than 5, but less than 10), Fisher's exact test was used for the rates less than 5. The significance threshold for the null hypothesis was p = 0.05.

Table 1. CHA2DS2 VASc and HAS-BLED scores in patients not receiving ATT

Parameter	Score						
	CHA2DS2 VASc						
Number of patients, n (%)	0	1	2	3	4	5	6
	11 (22.0)	12 (24.0)	11 (10.0)	5 (10.0)	7 (14.0)	3 (6.0)	1 (2.0)
	HAS-BLED						
Number of patients, n (%)	0	1	2	3	4	5	6
	25 (50.0)	16 (32.0)	6 (12.0)	3 (6.0)	0	0	0

ATT, antithrombotic therapy; CHA2DS2 VASc, thromboembolic risk score; HAS-BLED, bleeding risk score.

ISSN 0022-9040. Kardiologiia. 2022;62(8). DOI: 10.18087/cardio.2022.8.n2046

Results

CA was considered effective if there were no complaints of arrhythmic heartbeat, palpitations, and cardiac disruptions, and AF paroxysms on ECG or 24-hour ECG monitoring.

Patients with paroxysmal AF

The paroxysmal AF group included 75 (24.8%) patients.

In 12 months, the effective CA subgroup included 31 (41.3%) patients. No adverse outcomes were observed in this subgroup. There were 44 (58.6%) patients in the CA failure subgroup in 12 months. There were no cases of bleeding or TEEs. Repeat RFA of AF foci was performed in 12 (27.3%) cases.

In 24 months, the effective CA subgroup included 42 (56.0%) patients. There were no adverse outcomes. The CA failure subgroup included 33 (44.0%) patients in 24 months. TEE were reported in 2 (6.0%) cases: LA appendage thrombosis in 1 (3.0 %) patient (warfarin in non-target INR) and ischemic CVA in 1 (3.0%) (dabigatran). Bleeding was reported in 3 (9.1%) patients: nosebleed in 1 (3.0%) patient (rivaroxaban), rectal bleeding in 1 (3.0%) patient (dabigatran), and gastrointestinal bleeding that did not require surgery in 1 (3.0%) patient (rivaroxaban). Repeat RFA of AF foci was performed in 14 (42.4%) cases within 12 months.

In 36 months, the effective CA subgroup included 49 (65.3 %) patients. There were no adverse outcomes in this subgroup. The CA failure subgroup included 26 (34.6%) patients. TEEs were reported in 2 (7.7 %) cases: lower extremity vein thrombosis in 1 (3.8 %) patient (ASA) and transient ischemic attack in 1 (3.8 %) patient (warfarin in non-target INR). AAT and ATT administered in patients with paroxysmal AF are presented in Table 2.

There were no statistically significant differences in the Cha2DS2 VASc and HAS-BLED scores between the subgroups.

Patients with a history of effective interventional treatment did not have adverse outcomes during ATT in the follow-up period, unlike patients with CA failure and thrombotic and hemorrhagic complications.

Patients with persistent AF

The persistent AF group included 164 (54.4 %) patients.

In 12 months, the effective CA subgroup included 88 (53.6%) patients. There were no cases of TEE in this subgroup, and 2 (2.3%) patients were reported to have minor bleeding: nosebleed (warfarin with INR achieved) and bleeding gums (rivaroxaban). The CA failure subgroup included 76 (46.3%) patients in 12 months. Lower extremity vein thrombosis was diagnosed in 1 (1.3%) case (rivaroxaban) and another 1 (1.3%) patient had bleeding gums (rivaroxaban). Repeat RFA of AF foci was performed in 17 (22.4 %) cases.

In 24 months, the effective CA subgroup included 97 (59.1%) patients. CVA was reported in 1 (1.0%) patient (apixaban). Bleeding was diagnosed in 4 (4.0%) cases: hemarthrosis in 1 (1.0%) patient (warfarin with unachieved INR), bleeding gums in 1 (1.0%) patient (rivaroxaban), and rectal bleeding in 2 (2.0%) patients (apixaban, dabigatran). The CA failure subgroup included 67 (41.4%) patients in 24 months. TEE were detected in 3 (4.5%) patients: lower

Table 2. Treatment in patients with paroxysmal AF

Parameter	Control points					
	12 months		24 months		36 months	
	(+) n = 31	(–) n = 44	(+) n = 42	(–) n = 33	(+) n = 49	(–) n = 26
Antiarrhythmic therapy, n (%)						
Allapinin	1 (3.2)	3 (6.8); p = 0.495	2 (4.8)	3 (9.1); p = 0.456	2 (4.1)	2 (7.7); p = 0.508
Amiodarone	5 (16.1)	8 (18.2); p = 0.817	5 (11.9)	6 (18.2); p = 0.446	3 (6.1)	8 (30.8); p = 0.004
Beta-blockers	3 (9.7)	7 (15.9); p = 0.434	2 (4.8)	6 (18.2); p = 0.062	6 (6.1)	7 (26.9); p = 0.110
Propafenone	7 (22.6)	7 (15.9); p = 0.465	3 (7.1)	6 (18.2); p = 0.144	2 (4.1)	2 (7.7); p = 0.508
Sotalol	8 (25.8)	17 (38.6); p = 0.246	13 (15.4); n = 84	8 (24.2); p = 0.266	12 (14.0)	5 (19.2); p = 0.605
Ethacizine	0	0	0	1 (3.0); p = 0.256	1 (2.0)	2 (7.7); p = 0.235
No	8 (25.8)	2 (4.5); p = 0.008	21 (50.0)	4 (12.1); p = 0.001	29 (59.1)	0; p < 0.001
Antithrombotic therapy, n (%)						
Apixaban	3 (9.7)	9 (20.5); p = 0.210	4 (9.5)	7 (21.2); p = 0.156	3 (6.1)	4 (15.4); p = 0.189
ASA	5 (16.1)	3 (6.8); p = 0.198	7 (16.7)	8 (24.2); p = 0.416	7 (14.3)	6 (23.1); p = 0.338
Warfarin	3 (9.7)	4 (9.3); p = 0.931	3 (7.1)	2 (6.1); p = 0.852	3 (6.1)	5 (19.2); p = 0.080
Dabigatran	8 (25.8)	10 (22.7); p = 0.758	5 (12.2)	4 (12.1); p = 0.977	5 (10.2)	3 (11.5); p = 0.859
Rivaroxaban	8 (25.8)	14 (31.8); p = 0.573	6 (14.3)	11 (33.3); p = 0.050	5 (10.2)	6 (23.1); p = 0.134
No	3 (9.7)	4 (9.0); p = 0.931	16 (38.0)	1 (3.0); p < 0.001	26 (53.1)	2 (7.7); p < 0.001

ASA, acetylsalicylic acid; (+) = effective catheter ablation subgroup; (–) = catheter ablation failure subgroup; p = statistical significance of differences between the effective catheter ablation group and catheter ablation failure group.

extremity vein thrombosis in 1 (1.5%) patient (apixaban), LA appendage thrombosis in 1 (1.5%) patient, CVA in another in 1 (1.5%) patient (warfarin with achieved INR). Bleeding was diagnosed in 6 cases: nosebleed in 3 (4.5%) patient (dabigatran, apixaban, rivaroxaban), bleeding gums in 2 (2.9%) patients (rivaroxaban, warfarin), and rectal bleeding in 1 (1.4%) patient (apixaban). Repeat RFA of AF foci was performed in 21 (31.3%) cases.

In 36 months, the effective CA subgroup included 98 (59.7%) patients. TEEs were not reported. Bleeding was diagnosed in 7 (7.1%) cases: nosebleed in 1 (1.0%) patient (rivaroxaban), bleeding gums in 5 (5.1%) patients (apixaban (n=2), warfarin with achieved INR (n=2), rivaroxaban (n=1)) and rectal bleeding in 1 (1.0%) patient (apixaban). The CA failure subgroup included 66 (40.3%) patients. TEEs were reported in 5 (5.1%) patients: 1 (1.04%) patient had fatal CVA (rivaroxaban), 2 (2.04%) patients had CVA (warfarin with achieved INR, rivaroxaban), 1 (1.04%) patient had lower extremity vein thrombosis (apixaban), and another 1 (1.04%) patient had LA appendage thrombosis (dabigatran). Bleeding was diagnosed in 8 (12.1%) patients: nosebleed in 2 (3.0%) patients (rivaroxaban, warfarin with achieved INR), bleeding gums in 4 (6.1%) patients (warfarin with unachieved INR, rivaroxaban), and 2 (3.0%) patients had rectal bleeding (apixaban, warfarin with unachieved INR). Repeat RFA of AF foci was conducted in 14 (21.2%) cases. AAT and ATT administered in patients with persistent AF are presented in Table 3.

There were no statistically significant differences in the Cha2DS2 VASc and HAS-BLED scores between the two subgroups.

It can be concluded that thrombotic events were statistically significantly less frequent in patients with a history of effective CA during the entire follow-up period than in patients with ablation failure during ATT.

Patients with long-term persistent AF

The long-term persistent AF group included 63 (20.8%) patients.

In 12 months, the effective CA subgroup included 41 (65.0%) patients. TEEs were not reported. One (2.4%) patient had bleeding gums (dabigatran). The CA failure subgroup included 22 (34.9 %) patients in 12 months. Fatal MI was documented in 1 (2.4 %) patient, there were no other adverse outcomes. Repeat RFA of AF foci was performed in 6 (27.3%) cases.

In 24 months, the effective CA subgroup included 34 (53.9%) patients. There were no cases of TEEs or bleeding. The CA failure subgroup included 28 (44.4%) patients in 24 months. Fatal ischemic CVA was reported in 1 (3.6 %) case (dabigatran). Minor bleeding was diagnosed in 3 (10.7%) patients: 1 (3.4%) patient had nosebleed (warfarin with achieved INR) and 2 (7.1%) patients had bleeding gums (dabigatran). Repeat RFA of AF foci was performed in 4 (14.3 %) cases.

In 36 months, the effective CA subgroup included 36 (57.1%) patients. TEEs were not reported. One

Table 3. Treatment in patients with persistent AF

Parameter	Control points					
	12 months		24 months		36 months	
	(+) n = 88	(–) n = 76	(+) n = 97	(–) n = 67	(+) n = 98	(–) n = 65
Antiarrhythmic therapy, n (%)						
Allapinin	4 (4.5)	5 (6.6); p = 0.569	6 (6.2)	1 (1.5); p = 0.144	5 (5.1)	3 (4.5); p = 0.888
Amiodarone	43 (48.9)	26 (34.2); p = 0.058	25 (25.8)	21 (31.3); p = 0.435	18 (18.4)	26 (40.0); p = 0.002
Beta-blockers	4 (4.5)	8 (10.5); p = 0.142	21 (21.9)	14 (20.9); p = 0.908	21 (21.4)	18 (27.3); p = 0.359
Propafenone	13 (14.8)	14 (18.4); p = 0.530	11 (11.3)	6 (9.0); p = 0.622	10 (10.2)	3 (4.5); p = 0.197
Sotalol	22 (25.0)	20 (26.3); p = 0.847	15 (15.5)	24 (35.8); p = 0.003	16 (16.3)	15 (22.7); p = 0.282
Ethacizine	1 (1.1)	0; p = 0.351	0	0	1 (1.0)	0; p = 0.414
No	1 (1.1)	1 (1.3); p = 0.917	18 (18.6)	4 (12.1); p = 0.020	27 (27.6)	1 (1.5); p < 0.001
Antithrombotic therapy, n (%)						
Apixaban	16 (18.2)	21 (27.6); p = 0.149	16 (16.5)	15 (22.4); p = 0.343	19 (19.4)	16 (24.2); p = 0.426
ASA	1 (1.1)	1 (1.3); p = 0.917	8 (8.2)	1 (1.5); p = 0.062	13 (13.3)	2 (3.0); p = 0.028
Warfarin	15 (17.0)	12 (15.8); p = 0.829	12 (12.4)	13 (19.4); p = 0.218	6 (6.1)	13 (19.7); p = 0.007
Dabigatran	17 (19.3)	12 (15.8); p = 0.555	16 (16.5)	11 (16.4); p = 0.990	10 (10.2)	9 (13.6); p = 0.478
Rivaroxaban	38 (43.2)	29 (38.2); p = 0.514	24 (24.7)	25 (37.3); p = 0.084	25 (25.5)	24 (36.4); p = 0.120
No	0	1 (1.3); p = 0.280	21 (21.6)	3 (4.5); p = 0.002	26 (26.5)	2 (3.0); p < 0.001

ASA, acetylsalicylic acid; (+) = effective catheter ablation subgroup; (–) = catheter ablation failure subgroup; p = statistical significance of differences between the effective catheter ablation group and catheter ablation failure group.

ISSN 0022-9040. Kardiologiia. 2022;62(8). DOI: 10.18087/cardio.2022.8.n2046

(2.8%) patient had bleeding gums (dabigatran). The CA failure subgroup included 25 (39.6%) patients. There were 3 (12.0%) deaths, including 2 (8.0%) patients had ischemic CVA (dabigatran, rivaroxaban) and 1 (4.0%) case of MI (rivaroxaban). Nosebleed was diagnosed in 1 (4.0%) patient (apixaban). Repeat RFA of AF foci was performed in 7 (28.0%) cases. AAT and ATT administered in patients with long-term persistent AF are presented in Table 4.

Statistically significant differences in the Cha2DS2 VASc scores were identified only at the control point of 24 months. There were no statistically significant differences in the HAS-BLED scores in both subgroups.

It can be concluded that there were no thrombotic events in patients with effective CA during the entire follow-up period unlike patients with CA failure during ATT.

Discussion

According to the latest literature data, the efficacy of catheter procedures for AF can vary significantly depending on a technique of CA and a healthcare facility, where it was carried out [8–10]. The meta-analysis by Calkins et al. showed that the efficacy of a single procedure of RFA of AF foci is 57 %, it is 71 % for two-times RFA, AF RFA combined with antiarrhythmic drugs is effective in up to 77 % cases, and the efficacy of AAT without AF RFA is only 52 %. However, only 50-60 % of patients had no AF during the 5-year follow-up [11]. According to other data, catheter radiofrequency isolation of PVs eliminates AF in almost 80 % of patients [12, 13], thus, it is the gold standard of CA [14–16].

According to our findings, the long-term efficacy of CA was 65.3 % in patients with paroxysmal AF, 59.7 % in persistent AF, and 57.1 % in long-term persistent AF.

Increased efficacy of CA in patients with paroxysmal AF from 41.3 % (control point 12 months) to 65.3% (control point 36 months) is mainly due to repeated interventions in patients with recurrent arrhythmia. The need for repeated CA procedures is a pressing issue. Recurrent AF or atrial tachycardia after primary RFA of AF foci require the repeated interventions in 20-45% of patients [17]. There is general consensus on the fact that repeated procedures should be conducted at least 3 months after primary CA, because recurrent AF and/or atrial tachycardia in most cases develop in the first 2–3 months after RFA and can resolve spontaneously [18, 19]. In our study, repeated CA was required for patients with various forms of AF to achieve a long-lasting effect in 26 (34.6 %) cases of paroxysmal AF, 52 (59.0 %) cases of persistent AF, and 17 (26.9 %) cases of long-term persistent AF.

In summary, it can be concluded that the efficacy of intervention treatment for AF observed in our study correlates with the literature data and generally corresponds to the results of CA of AF foci in various Russian and foreign healthcare facilities.

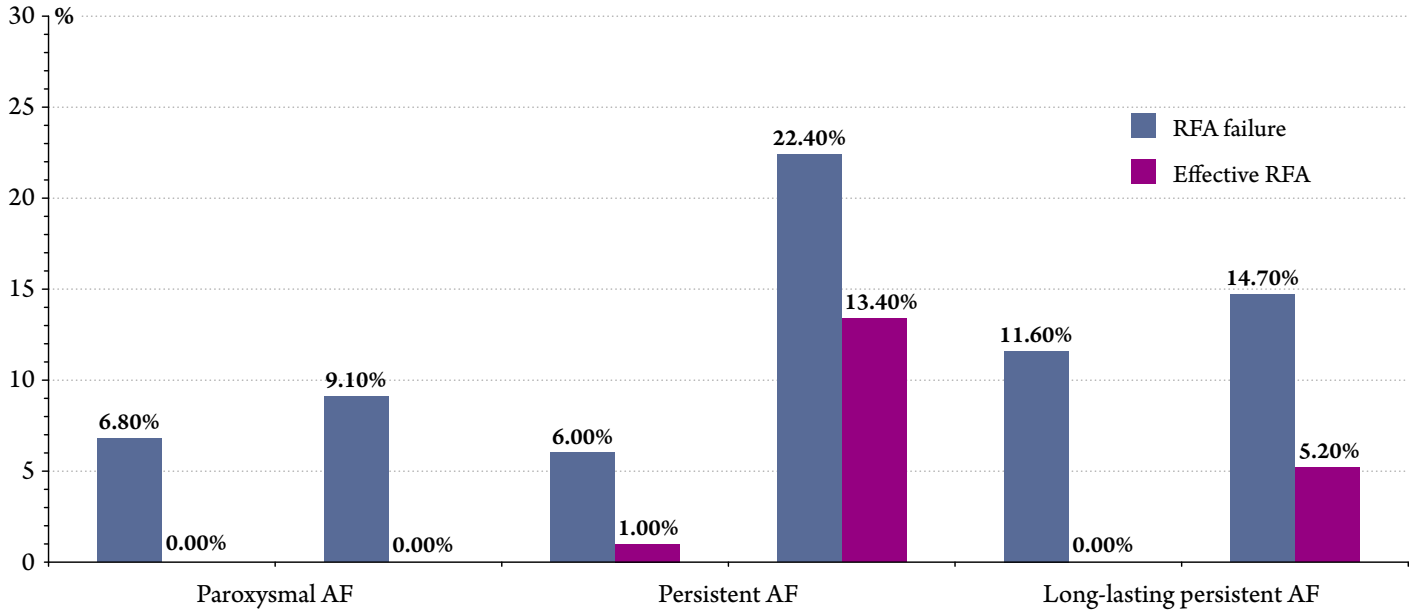
During the entire follow-up period, the mortality was significantly higher in patients with persistent and long-term persistent AF and a history of CA failure with, since there were no deaths in the effective CA subgroups. No deaths

Table 4. Treatment in patients with long-lasting persistent AF

Parameter	Control points					
	12 months		24 months		36 months	
	(+) n = 41	(–) n = 22	(+) n = 34	(–) n = 28	(+) n = 36	(–) n = 25
Antiarrhythmic therapy, n (%)						
Allapinin	0	0	1 (3.1)	0; p = 0.360	0	0
Amiodarone	16 (39.0)	10 (45.5); p = 0.621	8 (23.5)	10 (35.7); p = 0.293	7 (19.4)	7 (28.0); p = 0.435
Beta-blockers	4 (9.8)	5 (22.7); p = 0.161	7 (20.6)	9 (32.1); p = 0.301	5 (13.9)	13 (52.0); p = 0.001
Propafenone	7 (17.1)	2 (9.1); p = 0.388	2 (5.9)	1 (3.6); p = 0.673	2 (5.6)	0; p = 0.231
Sotalol	12 (29.3)	5 (22.7); p = 0.577	6 (17.6)	7 (25.0); p = 0.479	7 (19.4)	4 (16.0); p = 0.731
Ethacizine	0	0	0	0	0	0
No	1 (2.4)	0; p = 0.460	10 (29.4)	1 (3.4); p = 0.008	14 (38.9)	1 (4.0); p = 0.002
Antithrombotic therapy, n (%)						
Apixaban	8 (19.5)	7 (31.8); p = 0.274	4 (11.8)	6 (20.7); p = 0.303	4 (11.1)	7 (28.0); p = 0.092
ASA	0	0	4 (11.8)	0; p = 0.061	5 (13.9)	0; p = 0.052
Warfarin	9 (22.0)	5 (22.7); p = 0.944	6 (17.6)	5 (17.9); p = 0.983	6 (16.7)	3 (12.0); p = 0.613
Dabigatran	9 (22.0)	3 (13.6); p = 0.423	6 (17.6)	10 (35.7); p = 0.106	4 (11.1)	5 (20.0); p = 0.336
Rivaroxaban	15 (36.6)	7 (31.8); p = 0.705	3 (8.8)	4 (14.3); p = 0.499	3 (8.3)	6 (24.0); p = 0.090
No	0	0	12 (35.3)	2 (7.1); p = 0.008	15 (41.7)	4 (16.0); p = 0.033
CHA2DS2 VASc, score (M ± SE)	2.20 ± 0.25	2.45 ± 0.41; p=0.687	1.82 ± 0.25	2.83 ± 0.34; p=0.021	2.24 ± 0.27	2.36 ± 0.36; p=0.699

ASA, acetylsalicylic acid; (+) = effective catheter ablation subgroup; (–) = catheter ablation failure subgroup; p = statistical significance of differences between the effective catheter ablation group and catheter ablation failure group.

Figure 1. Development of CVA/TIA and minor bleeding in patients after catheter procedures for atrial fibrillation



CVA, acute cerebrovascular accident; TIA, transient ischemic attack

were reported among patients with paroxysmal AF during the entire follow-up period, regardless of the CA result.

Analysis of the data obtained showed that, during the entire follow-up period, the incidence of ischemic CVAs in patients with paroxysmal, persistent, and long-term persistent AF, who had a history of effective CA and received DOACs, was significantly lower (0%; 1% and 0%, respectively) than in patients with CA failure (6.8%; 6.0%, and 11.6%, respectively). In our opinion, this fact is indicative of a more favorable prognosis for the rhythm control strategy than the control of incidence of ischemic strokes in patients with AF, even despite the administration of DOACs, which can also be explained by the low adherence to treatment and, thus, irregular administration of anticoagulants, and the fact that it is not always possible to maintain INR within the therapeutic window (2.0–3.0), which is supported by the findings of large studies. The incidence of CVA in clinical trials RE-LY, ROCKET-AF, and ARISTOTLE ranged from 1.11 % to 2.2 % per year depending on the administered anticoagulant [4–6]. In our study, only one patient with effective RFA experienced ischemic CVA, which once again supports the need to maintain sinus rhythm.

When estimating the treatment safety, we analyzed the incidence of major and minor bleeding according to the accepted classification [7]. No major bleeding was reported in either group regardless of CA efficacy. Minor bleeding was significantly more frequent in the CA failure subgroups (Figure 1).

During the 36-month follow-up, DOACs were discontinued in the effective CA group, and adherence to treatment remained high in the CA failure group.

Conclusion

At the time of hospitalization, 50 (16.5%) patients did not receive ATT, and more than 50 % of them had a Cha2DS2 VASc score > 2; 24 (7.9%) patients took ASA with a mean score of 2. Of the 86 (28.4%) patients taking warfarin, only 20 (23.3%) patients achieved the target INR.

Thus, effective ablation and hybrid therapy for AF allows reducing the risk of ischemic stroke statistically significantly and virtually eliminate the possibility of other TEEs. The invasive strategy and ATT do not increase the risk of major and minor bleeding in this group of patients.

Limitations

Given the continuing risk of recurrence of AF and TEE despite the intervention treatment, ATT should be continued, as CA of AF foci is not 100 % effective.

Funding

The study had no financial support.

No conflict of interest is reported.

The article was received on 20/03/22

ISSN 0022-9040. Kardiologiia. 2022;62(8). DOI: 10.18087/cardio.2022.8.n2046

REFERENCES

1. Artemenko S.N., Romanov A.B., Turov A.N., Shabanov V.V., Elesin D.A., Yakubov A.A. et al. Comparison of outcomes of ostial and antral pulmonary vein isolation and ganglionated plexus ablation in patients with atrial fibrillation. Journal of Arrhythmology. 2012;68:14–20. [Russian: Артеменко С.Н., Романов А.Б., Туров А.Н., Шабанов В.В., Елесин Д.А., Якубов А.А. и др. Сравнительная оценка радиочастотной остиальной, антральной изоляции устьев легочных вен и аблации ганглионарных сплетений у пациентов с фибрилляцией предсердий. Вестник аритмологии. 2012;68:14–20]
2. Benjamin EJ, Wolf PA, D'Agostino RB, Silbershatz H, Kannel WB, Levy D. Impact of atrial fibrillation on the risk of death: the Framingham Heart Study. Circulation. 1998;98(10):946–52. DOI: 10.1161/01.cir.98.10.946
3. Wann LS, Curtis AB, January CT, Ellenbogen KA, Lowe JE, Estes NAM et al. 2011 ACCF/AHA/HRS Focused Update on the Management of Patients With Atrial Fibrillation (Updating the 2006 Guideline)): a report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines. Heart Rhythm. 2011;8(1):157–76. DOI: 10.1016/j.hrthm.2010.11.047
4. Connolly SJ, Ezekowitz MD, Yusuf S, Eikelboom J, Oldgren J, Parekh A et al. Dabigatran versus warfarin in patients with atrial fibrillation. New England Journal of Medicine. 2009;361(12):1139–51. DOI: 10.1056/NEJMoa0905561
5. Granger CB, Alexander JH, McMurray JJV, Lopes RD, Hylek EM, Hanna M et al. Apixaban versus warfarin in patients with atrial fibrillation. New England Journal of Medicine. 2011;365(11):981–92. DOI: 10.1056/NEJMoa1107039
6. Patel MR, Mahaffey KW, Garg J, Pan G, Singer DE, Hacke W et al. Rivaroxaban versus warfarin in nonvalvular atrial fibrillation. New England Journal of Medicine. 2011;365(10):883–91. DOI: 10.1056/NEJMoa1009638
7. Kakkar AK, Mueller I, Bassand J-P, Fitzmaurice DA, Goldhaber SZ, Goto S et al. International longitudinal registry of patients with atrial fibrillation at risk of stroke: Global Anticoagulant Registry in the FIELD (GARFIELD). American Heart Journal. 2012;163(1):13-19.e1. DOI: 10.1016/j.ahj.2011.09.011
8. Revishvili A.Sh., Rzaev F.G., Baimbetov A.K., Rashbaeva G.S. Electrophysiological assessment of outcomes of radiofrequency re-ablation of atrial fibrillation. Journal of Arrhythmology. 2009;57:29–40. [Russian: Ревишвили А.Ш., Рзаев Ф.Г., Баимбетов А.К., Рашбаева Г.С. Электрофизиологическая оценка результатов повторных процедур радиочастотной аблации фибрилляции предсердий. Вестник аритмологии. 2009;57:29–40]
9. Khlynin M.S., Popov S.V., Krivolapov S.N., Batalov R.E. Non-invasive topical diagnostics of heart arrhythmias. Circulation pathology and cardiac surgery. 2014;18(4):96–103. [Russian: Хлынин М.С., Попов С.В., Криволапов С.Н., Баталов Р.Е. Неинвазивная топическая диагностика нарушений ритма сердца. Патология кровообращения и кардиохирургия. 2014;18(4):96–103]
10. Eshmatov O.R., Batalov R.E., Dragunova M.A., Archakov E.A., Popov S.V. Efficacy and safety of anticoagulant therapy in real clinical practice in patients with persistent atrial fibrillation after interventional treatment. Journal of Arrhythmology. 2021;28(3):21–7. [Russian: Эшматов О.Р., Баталов Р.Е., Драгунова М.А., Арчаков Е.А., Попов С.В. Эффективность и безопасность антикоагулянтной терапии в реальной клинической практике у пациентов с персистирующей формой фибрилляции предсердий после интервенционного лечения. Вестник аритмологии. 2021;28(3):21–7]. DOI: 10.35336/VA-2021-3-21-27
11. Calkins H, Reynolds MR, Spector P, Sondhi M, Xu Y, Martin A et al. Treatment of Atrial Fibrillation With Antiarrhythmic Drugs or Radiofrequency Ablation: Two Systematic Literature Reviews and Meta-Analyses. Circulation: Arrhythmia and Electrophysiology. 2009;2(4):349–61. DOI: 10.1161/CIRCEP.108.824789

ISSN 0022-9040. Kardiologiia. 2022;62(8). DOI: 10.18087/cardio.2022.8.n2046

12. Arnson Y, Hoshen M, Berliner-Sendrey A, Reges O, Balicer R, Leibowitz M et al. Risk of Stroke, Bleeding, and Death in Patients with Nonvalvular Atrial Fibrillation and Chronic Kidney Disease. Cardiology. 2020;145(3):178–86. DOI: 10.1159/000504877
13. Zavadovsky KV, Saushkin VV, Khlynin MS, Popov SV, Lishmanov YB. Radionuclide Assessment of Cardiac Function and Dyssynchrony in Children with Idiopathic Ventricular Tachycardia. Pacing and Clinical Electrophysiology. 2016;39(11):1213–24. DOI: 10.1111/pace.12948
14. Pappone C, Rosanio S, Oreto G, Tocchi M, Gugliotta F, Vicedomini G et al. Circumferential Radiofrequency Ablation of Pulmonary Vein Ostia: A New Anatomic Approach for Curing Atrial Fibrillation. Circulation. 2000;102(21):2619–28. DOI: 10.1161/01.CIR.102.21.2619
15. Ministry of Health of Russian Federation. Clinical recommendations: Atrial fibrillation and flutter in adults. (CR382). Av. at: https://cr.minzdrav.gov.ru/recomend/382_1. 2020. [Russian: Министерство здравоохранения Российской Федерации. Клинические рекомендации: Фибрилляция и трепетание предсердий у взрослых. (КР382). 2020. Доступно на: https://cr.minzdrav.gov.ru/recomend/382_1]
16. Hindricks G, Potpara T, Dagres N, Arbelo E, Bax JJ, Blomström-Lundqvist C et al. 2020 ESC Guidelines for the diagnosis and management of atrial fibrillation developed in collaboration with the European Association of Cardio-Thoracic Surgery (EACTS): The Task Force for the diagnosis and management of atrial fibrillation of the European Society of Cardiology (ESC) Developed with the special contribution of the European Heart Rhythm Association (EHRA) of the ESC. European Heart Journal. 2020;42(5):373–498. DOI: 10.1093/eurheartj/ehaa612
17. Kobza R, Hindricks G, Tanner H, Schirdewahn P, Dorszewski A, Piorkowski C et al. Late recurrent arrhythmias after ablation of atrial fibrillation: Incidence, mechanisms, and treatment. Heart Rhythm. 2004;1(6):676–83. DOI: 10.1016/j.hrthm.2004.08.009
18. Revishvili A.Sh., Rzaev F.G., Sopov O.V., Labazanova A.L. Late outcomes of interventional treatment of atrial fibrillation. Journal of Arrhythmology. 2012;68:5–13. [Russian: Ревишвили А.Ш., Рзаев Ф.Г., Сопов О.В., Лабазанова А.Л. Отдаленные результаты интервенционного лечения фибрилляции предсердий. Вестник аритмологии. 2012;68:5–13]
19. Sauer WH, McKernan ML, Lin D, Gerstenfeld EP, Callans DJ, Marchlinski FE. Clinical predictors and outcomes associated with acute return of pulmonary vein conduction during pulmonary vein isolation for treatment of atrial fibrillation. Heart Rhythm. 2006;3(9):1024–8. DOI: 10.1016/j.hrthm.2006.05.007

ISSN 0022-9040. Kardiologiia. 2022;62(8). DOI: 10.18087/cardio.2022.8.n2046