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Effects of different interventions on prognosis and quality of life in patients with atrial fibrillation

Hongxia Wang MD, MSC | Jiajun Huang MD | Wenxi Gu MD, MSC | Xiaojiao Hao MD, MSC | Guiru Li MD, MSC | Yumin Yuan MD, MSC | Yingmin Lu MD, PhD

Department of Cardiology, Chongming Hospital Affiliated to Shanghai University of Medicine and Health Sciences, Shanghai, China

Correspondence
Yingmin Lu, Department of Cardiology, Chongming Hospital Affiliated to Shanghai University of Medicine and Health Sciences, No. 25 of Nanmen Road, Chengqiao Town, Chongming District, Shanghai 200000, China.
Email: yingminlu1821@163.com

Abstract

Objective: To compare the effects of different intervention measures on prognosis and quality of life in patients with atrial fibrillation, in order to provide clinical basis for diagnosis and treatment.

Methods: A total of 160 patients who visited several hospitals including Shanghai Xinhua Hospital from June 2019 to June 2021 were selected. Among them, 40 cases were in the drug treatment group (DRUG group), 40 cases in the radiofrequency ablation group (Radiofrequency ablation, RFA group), and 40 cases in the catheter ablation combined with percutaneous left atrial appendage occlusion group (""one-stop"" procedure group) and 40 cases in the percutaneous left atrial appendage closure group (Left atrial appendage closure, LAAC group). The Minnesota quality of life score (MLHFQ), ejection fraction (LVEF), and left atrial anterior and posterior diameters (LAD) were compared between the groups at 1-year follow-up, and the differences in adverse events were compared between the groups.

Results: (1) After a 1-year follow-up, overall comparison, the MLHFQ scores and the LVEF and the LAD among the four groups were statistically different ($p < .01$); (2) Multiple comparisons, ① the MLHFQ scores: The RFA group was the lowest, the "one-stop" operation group was lower than the DRUG group, the LAAC group was the highest ($p < .01$). ② LVEF: The RFA group was the highest, the "one-stop" procedure group was higher than the drug treatment group, the LAAC group was the lowest ($p < .01$). ③ LAD: the RFA group and the "one-stop" procedure group were smaller than the DRUG group, the DRUG group was smaller than the LAAC group ($p < .01$). (3) Compared with the baseline data after 1-year follow-up in each group, in the RFA group and in the "one-stop" procedure group, the MLHFQ scores was decreased, the LVEF was increased, and the LAD was decreased ($p < .01$); in the DRUG group: the difference was not statistically significant ($p > .05$); in the LAAC group, the MLHFQ scores was increased, the LVEF was decreased, and the LAD was increased ($p < .01$). (4) There were significant differences in the incidence of adverse events among the four groups ($p < .01$), the lowest in the RFA group and the highest in the LAAC group.

Conclusion: Compared with drug treatment, radiofrequency ablation and "one-stop" procedure group can improve the quality of life of patients with atrial fibrillation, improve cardiac function, and reduce the occurrence of adverse events. Percutaneous left atrial appendage occlusion affects patients' quality of life and improves cardiac function, and increases the incidence of adverse events.

KEYWORDS
atrial fibrillation, heart failure, left atrial appendage closure, prognosis, quality of life score, radiofrequency ablation

1 | INTRODUCTION

Atrial fibrillation (AF) is a common clinical cardiac arrhythmia and its incidence increases with age. Atrial fibrillation and heart failure (HF) have been found to be mutually causal in clinical practice, and have become an important factor affecting the health of the middle-aged and elderly population. The treatment of atrial fibrillation can be divided into drug therapy and surgery. Studies (Abdin et al., 2019; Wang et al., 2019) found that drug therapy alone (antiarrhythmic drugs) had no obvious benefit in the control of atrial fibrillation, and had limited effect on improving prognosis. Patients with atrial fibrillation who choose surgery have a better prognosis than drug therapy alone. Regardless of radiofrequency ablation or cryoablation, for middle-aged and elderly patients with atrial fibrillation who have surgical conditions, the prognosis of surgical treatment is better than that of medical treatment. International expert consensus (Calkins et al., 2017) proposes that catheter ablation can be used as a first-line treatment for patients with paroxysmal atrial fibrillation. For patients with atrial fibrillation without surgical conditions, antiarrhythmic drugs can be selected to achieve rhythm control. Regardless of whether rhythm control or heart rate control is selected, anticoagulation therapy is required for patients with high thrombosis risk to prevent stroke. 90% of the thrombus in patients with atrial fibrillation originate from the left atrial appendage. For patients with atrial fibrillation who are clinically at high bleeding risk or who are unwilling to take long-term oral anticoagulants, left atrial appendage occlusion is an optional alternative to anticoagulant drugs to prevent stroke. For middle-aged and elderly patients with atrial fibrillation, due to many comorbidities, high risk of thrombosis and bleeding, and relatively high recurrence rate of radiofrequency ablation, catheter ablation combined with percutaneous left atrial appendage occlusion ("one-stop" procedure) can be used. Previous studies (Chen et al., 2022) have confirmed that "one-stop" procedure is safe and effective. This study analyzed the effects of different treatment strategies (drug therapy, radiofrequency ablation, "one-stop" procedure, left atrial appendage closure) on prognosis and quality of life in patients with atrial fibrillation, in order to provide a basis for clinical strategy selection.

2 | MATERIALS AND METHODS

2.1 | Select

Select 160 patients with atrial fibrillation who were treated in several hospitals including Shanghai Xinhua Hospital from June 2018 to June 2021, and were divided into drug treatment group 40 cases, radiofrequency ablation group 40 cases. There were 40 cases in the "one-stop" procedure group and 40 cases in the left atrial appendage occlusion group. Record the basic information of patients, including age, gender, body mass index, history of tobacco and alcohol, past medical history, laboratory indicators, ultrasound results, and quality of life scores. After 1 year follow-up, quality of life scores were re-examined, echocardiography was reviewed, ejection fraction, left atrial anterior and posterior diameters were recorded, and adverse events were analyzed (including cardiac readmission, new stroke, cardiac death, and all-cause death).

2.2 | Inclusion criteria

(1) Atrial fibrillation patients with a clear diagnosis; (2) NYHA cardiac function class II or III; (3) age ≥ 18 years; (4) approved by the hospital ethics committee.

2.3 | Exclusion criteria

(1) Patients with valvular atrial fibrillation, acute myocardial infarction, hyperthyroidism, severe liver and kidney dysfunction, blood system diseases and abnormal immune system; (2) patients with mental illness; (3) those with incomplete clinical data.

2.4 | Treatment methods

2.4.1 | Drug treatment group (DRUG group)

All patients use antiarrhythmic drugs according to individual conditions. All patients were maintained with amiodarone hydrochloride

tablets (Sanofi-Aventis (Hangzhou) Pharmaceutical Co., Ltd.) or sotalol hydrochloride tablets (Sino-American Shanghai Squibb Pharmaceutical Co., Ltd.) according to individual conditions. Sinus rhythm, use beta-blockers or digoxin tablets (Shanghai Shanghai Pharmaceutical Xinyi Pharmaceutical Co., Ltd.) to control the ventricular rate so that the average heart rate is ≤90 beats/min at rest and ≤90 beats/min during exercise 110 times/min (Abdin et al., 2019). If this criterion was not met at baseline, medication was adjusted regularly at outpatient follow-up to achieve the goal. Medications to improve cardiac function are recommended according to individual conditions using guidelines.

2.4.2 | Radiofrequency ablation group (Radiofrequency ablation, RFA group)

Before ablation, all patients underwent transesophageal echocardiography to exclude left atrial appendage thrombus. All patient operations were successfully completed by experienced electrophysiologists.

2.4.3 | "one-stop" procedure group

Before ablation, all patients underwent transesophageal echocardiography to exclude left atrial appendage thrombus. During radiofrequency ablation, left atrial appendage closure was performed at the same time.

2.4.4 | Left atrial appendage closure group (LAAC group)

All patients were treated with antiarrhythmic drugs and left atrial appendage closure according to individual conditions.

2.5 | Observation indicators

All patients were followed up by means of inpatient medical record review, outpatient follow-up, and telephone. Comprehensive score of quality of life: According to the Minnesota quality of life score (MLHFQ), the quality of life of patients before treatment and 1 year after treatment was comprehensively assessed. The changes of ejection fraction (LVEF) and left atrial anterior and posterior diameters (LAD) were recorded before treatment and 1 year after treatment. The incidence of adverse events in each group was assessed, including cardiac readmission, new stroke (including embolism and bleeding), cardiac death, and all-cause death.

2.6 | Statistical methods

SPSS 16.0 software was used for statistical analysis of data. Measurement data with normal distribution were expressed as mean ± SD. The comparison of means among multiple groups was performed by analysis of variance, and the multiple comparison was performed by Dunnett's T3 test. Therefore, the inspection level is 0.05/6 = 0.0083. When differences between groups were compared, differences were statistically significant when p value <.0083. The 1-year follow-up was compared with baseline using paired t-test. The statistical description of non-normally distributed data is expressed by mean rank, and the K Independent Samples Test is used. The enumeration data were expressed as rates, and the Crosstabs test was used to compare the rates among multiple groups, and the test level was $\alpha = 0.05$.

3 | STATISTICAL RESULTS

3.1 | Baseline data comparison

A total of 160 patients with atrial fibrillation were included in the study, including 40 in the drug treatment group, 40 in the radiofrequency ablation group, 40 in the "one-stop" procedure group, and 40 in the LAAC group. There was no statistical difference in the baseline data of the four groups of patients.

3.2 | Comparison of observation indicators

3.2.1 | Comparing the quality of life and cardiac function among the four groups of patients after one-year follow-up, the RFA group was the best, the "one-stop" group was the second, and the LAAC group was the worst

During the 1-year follow-up, the overall comparison showed that there were significant differences in the MLHFQ scores, LVEF, and LAD among the four groups ($p < .01$) (see Table 1). In multiple comparisons, the MLHFQ scores in the RFA group was lower than that in the other three groups, LVEF was higher than that in the other three groups, and the LAD was smaller than that in the drug treatment group and the LAAC group. The "one-stop" procedure group had a lower quality of life score than the drug treatment group and LAAC group, LVEF was higher than that in the drug treatment group and LAAC group, and LAD was smaller than that in the drug treatment group and LAAC group. The MLHFQ scores in the drug treatment group was lower than that in the LAAC group, LVEF was higher than that in the LAAC group, and the LAD was smaller than that in the LAAC group (see Table 1). Compared with drug therapy, radiofrequency ablation and "one-stop" procedure can improve the quality of life of patients with atrial fibrillation and improve cardiac function. And radiofrequency ablation is superior to "one-stop" procedure, while left atrial appendage closure alone affects the quality of life and cardiac function improvement in patients with atrial fibrillation.

The follow-up data after 1 year in each group were compared with the baseline data, the follow-up data after 1 year in the RFA group and the "one-stop" procedure group were compared with the

TABLE 1 Comparison of baseline data of four groups of patients and comparison of ejection fraction, left atrial anterior–posterior diameter, quality of life score and incidence of adverse events among four groups of patients

	DRUG	RFA	One-stop	LAAC	*F*	*p*
Age (mean ± SD)	62.80 ± 5.33	62.55 ± 5.31	63.58 ± 4.49	62.95 ± 6.02	0.270	.847
Male [*n* (%)]	15 (37.5%)	20 (50.0%)	19 (47.5%)	19 (47.5%)	1.486	.685
smoke [*n* (%)]	9 (22.5%)	16 (40.0%)	17 (42.5%)	16 (40.0%)	4.435	.218
drink [*n* (%)]	16 (40.0%)	17 (42.5%)	22 (55.0%)	18 (45%)	4.435	.218
BMI (mean rank)	77.02	88.89	82.55	73.54	2.528	.472
HP [*n* (%)]	26 (65.0%)	27 (67.5)	27 (67.5%)	28 (70.0%)	0.228	.973
DM [*n* (%)]	10 (25.0%)	12 (30.0%)	13 (32.5%)	14 (35.0%)	1.030	.794
CAD [*n* (%)]	12 (30.0%)	11 (27.5%)	14 (35.0%)	12 (30.0%)	0.559	.93
MI [*n* (%)]	2 (5.0%)	3 (7.5%)	2 (5.0%)	3 (7.5%)	0.608	1.000
CKD [*n* (%)]	6 (15.0%)	4 (10.0%)	5 (12.5%)	4 (10.0%)	0.723	.949
TIA [*n* (%)]	8 (20.0%)	8 (20.0%)	7 (17.5%)	6 (15.0%)	0.463	.968
COPD [*n* (%)]	3 (7.5%)	3 (7.5%)	2 (5.0%)	4 (10.0%)	0.838	.975
NYHAIII [*n* (%)]	7 (17.5%)	9 (22.5%)	9 (22.5%)	9 (22.5%)	0.448	.961
BNP (mean rank)	76.76	78.88	91.69	74.68	3.275	.351
CR (mean rank)	78.08	86.84	77.81	79.28	1.022	.796
CHA2DS2 (mean rank)	78.51	78.00	75.79	89.70	2.793	.425
HAS-BLED (mean rank)	84.50	78.50	78.50	80.50	0.795	.851
EF (mean ± SD)	56.20 ± 2.75	55.18 ± 3.50	55.02 ± 3.19	55.42 ± 3.40	1.053	.371
LA (mean ± SD)	40.75 ± 2.26	40.85 ± 3.00	41.00 ± 2.11	40.82 ± 2.85	0.066	.978
MLHFQ (mean ± SD)	38.15 ± 7.27	37.30 ± 6.73	37.0 ± 5.81	38.32 ± 3.76	49.719	.715
Adverse event [*n* (%)]	15 (37.5%)	6 (15.0%)	9 (22.5%)	21 (52.5%)	15.283	.002

Note: EF, LA, and MLHFQ were the baseline ejection fraction, left atrial diameter, and Minnesota quality of life scores; Multiple comparisons are Dunnett T3 test, Significant markers a, b, and c were <0.05 compared with DRUG group, RFA group, and one-stop group, respectively. $p < .05$ means the difference is statistically significant.

baseline data, the MLHFQ scores decreased, LVEF increased, and the left atrial diameter decreased. Statistical significance ($p < .01$): Compared with the baseline data, the follow-up data of the drug treatment group after 1 year showed no significant difference in quality of life score, ejection fraction, and left atrial anterior and posterior diameter ($p > .05$); Compared with the baseline data, the follow-up data in the LAAC group after 1 year showed an increase in the MLHFQ scores, a decrease in LVEF, and an increase in the anterior and posterior diameter of the left atrium, and the differences were statistically significant ($p < .01$) (Table 1). Surgical treatment can improve the quality of life and cardiac function of patients with atrial fibrillation, while left atrial appendage closure alone affects the quality of life and cardiac function of patients with atrial fibrillation.

3.2.2 | The patients in the four groups were followed up for 1 year, the incidence of adverse events was the lowest, and the LAAC group was the highest

There was a statistically significant difference in the incidence of adverse events among the four groups ($p < .01$), the lowest in the RFA group and the highest in the LAAC group (see Table 1). There was a statistically significant difference in the LVEF, LA, MLHFQ scores among the four groups ($p < .01$) (see Table 2). During the 1-year follow-up, no cardiac death, all-cause death, or new stroke occurred in each group. The major adverse events in each group were readmissions for psychological reasons. Radiofrequency ablation and "one-stop" procedure can reduce the incidence of adverse events, while left atrial appendage closure alone increases the incidence of adverse events in patients with atrial fibrillation (Table 2).

4 | DISCUSSION

In patients with atrial fibrillation, maintenance of sinus rhythm is important. Maintenance of sinus rhythm in patients with atrial fibrillation can effectively prevent tachycardiomyopathy and reduce the risk of stroke (Hunter et al., 2014). The study of (Kelly et al., 2019) suggested that rhythm control can effectively reduce the risk of all-cause mortality within 1 year. Radiofrequency ablation can effectively maintain sinus rhythm in patients with atrial fibrillation and prevent atrial remodeling. The CASTLE-AF study and the AATAC study (Marrouche et al., 2018) suggest that radiofrequency ablation can significantly improve the cardiac function of patients with atrial fibrillation in the early stage, and reduce the readmission rate and

TABLE 2 Paired *t*-test (LVEF, LA, MLHFQ scores) of patients in each group after 1-year follow-up VS baseline level

	EF			LA			MLHFQ score		
	t	*p*	*AD*	*t*	*p*	*AD*	*t*	*p*	*AD*
DRUG[a]	0.585	0.562	4.30	−1.554	0.128	0.35	−0.077	0.939	.03
RFA[b]	−18.41	0.000	8.43	36.64	0.000	5.08	21.272	0.000	11.48
One stop[c]	−22.395	0.000	4.95	22.09	0.000	4.25	9.658	0.000	6.23
LAAC[d]	22.273	0.000	10.13	−10.63	0.000	6.38	−32.25	0.000	7.90
p		0.000				0.000		0.000	

Note: $p < 0.05$ means the difference is statistically significant. AD refers to the absolute difference between the LVEF, LA, MLHFQ scores 1-year data and the baseline data.

[a]the baseline data of the drug treatment group vs the 1-year follow-up data.

[b]the baseline data of the radiofrequency ablation group vs the 1-year follow-up data.

[c]the baseline data of "one-stop" surgery group vs data of 1-year follow-up.

[d]the baseline data vs 1-year follow-up data in the LAAC group.

mortality compared with drug therapy. Studies (Gupta et al., 2021; Samuel et al., 2021) showed that the improvement of patients' quality of life after radiofrequency ablation was closely related to the reduction of atrial fibrillation burden, the improvement of atrial fibrillation quality of life was highly correlated with AF burden, and the cardiovascular hospitalization rate was significantly reduced after ablation (42%, $p = .001$). A study by (Go et al., 2018) suggested that atrial fibrillation burden is related to patient symptoms, heart failure, and stroke. Patients typically report an improvement in quality of life associated with a significant reduction in the frequency of arrhythmias (Marrouche et al., 2018). In the CASTLE-AF trial, patients with a high AF burden before ablation had a greater reduction in AF burden after ablation. Ablation may have a more significant improvement in quality of life in patients with a higher AF burden, but further studies are needed (Brachmann et al., 2021; Gupta et al., 2021).

The MLHFQ scores mainly includes the evaluation of four aspects: social function, psychological function, physical function and material life status, which objectively reflects the quality of life and recovery of the patient. This study showed that among the four groups of patients, the radiofrequency ablation group and the "one-stop" procedure group had significantly better quality of life scores than the drug treatment group, and the left atrial appendage occlusion group had the worst quality of life score. Radiofrequency ablation can significantly improve the quality of life and cardiac function of patients with atrial fibrillation, and can reduce the occurrence of adverse events. Although the improvement of quality of life and cardiac function of patients in the "one-stop" procedure group was not as good as that in the radiofrequency ablation group, it had advantages for patients who could not tolerate long-term regular anticoagulant therapy. However, patients with left atrial appendage occlusion effectively avoided atrial fibrillation anticoagulation therapy and avoided the risk of bleeding, but it did not help the improvement of quality of life scores and cardiac function.

The MLHFQ scores of the patients in the radiofrequency ablation group after 1 year was better than that of the other treatment groups. Radiofrequency ablation is not only beneficial to improve the cardiac function of patients with atrial fibrillation, but also can significantly improve the quality of life of the patients. The benefit of radiofrequency ablation is better than that of medical treatment, especially in patients younger than 65 years old (Bahnson et al., 2022). Compared with drug therapy, radiofrequency ablation can more effectively maintain sinus rhythm in patients with atrial fibrillation and heart failure, improve cardiac function, and reduce readmission rates and mortality (Xu et al., 2022). A study (Ding et al., 2020) showed that compared with normal people, the incidence of stroke in patients with atrial fibrillation increased by 5 times, and compared with other stroke patients, the disability rate and fatality rate were higher. Catheter ablation is the first-line treatment for atrial fibrillation, but no clinical trials have confirmed the safety of anticoagulant discontinuation after atrial fibrillation ablation. Therefore, the 2016 ESC guidelines recommend: for patients with atrial fibrillation at high stroke risk, even after Catheter ablation also requires long-term oral anticoagulation to prevent stroke. The safety and efficacy of LAAC have been confirmed by a number of clinical trials (Cruz-González et al., 2020; Glikson et al., 2020; Mohrez et al., 2021; Saad et al., 2022), LAAC is no less effective than warfarin in preventing thromboembolic events, and the long-term bleeding risk is much lower than warfarin. Left atrial appendage closure (LAAC) is an alternative treatment strategy for stroke prevention in patients with atrial fibrillation who are not candidates for long-term oral anticoagulant therapy (Cruz-González et al., 2020; Takeda et al., 2022). LAAC can effectively prevent thromboembolic events as well as bleeding events, LAAC is non-inferior to newer oral anticoagulants in preventing bleeding events, and significantly reduces non-surgical bleeding, but it is not helpful for cardiac rhythm control. "One-stop" procedure can effectively control heart rhythm and prevent thromboembolic events, and the surgical steps of atrial fibrillation catheter ablation and left atrial appendage closure are partially the same. "One-stop" procedure can avoid repeated interventional operations, and compared with fractional surgery, it can reduce hospital days, hospital costs, and the use of oral anticoagulants, reduce bleeding risks, and improve quality of life (Turagam et al., 2017). In recent years, more and more centers in my country have carried out left

atrial appendage closure and "one-stop" procedure. The safety and efficacy of left atrial appendage closure and "one-stop" procedure have also been gradually demonstrated (Dognin et al., 2022; Falasconi et al., 2021; Kany et al., 2022; Mo et al., 2022; Osmancik et al., 2022; Wang et al., 2021; Yang et al., 2021). A study reported (Yang et al., 2021) that both the "one-stop" procedure treatment group and the simple ablation group showed significant improvement in left atrial function, and left atrial appendage occlusion did not affect the improvement of left atrial function after radiofrequency ablation. Another study (Wang et al., 2021) proposed that natriuretic peptide concentrations did not change during 6-month follow-up after LAAC. The present study showed that 1 year after LAAC, patients' quality of life decreased, left atrium enlarged, and ejection fraction decreased. In the "one-stop" procedure group, the MLHFQ scores decreased, LVEF increased, and the left atrial diameter decreased compared with the baseline at 1-year follow-up. A study (Zhu, 2020) confirmed that "one-stop" procedure was similar to LAA occlusion in preventing thromboembolic events, and that patients with "one-stop" procedure had a lower risk of hospital admission for heart failure and/or atrial fibrillation than LAA occlusion group, accompanied by an improvement in cardiac function. Romanov et al., 2015 showed that there was no significant difference in the long-term recurrence rate between the "one-stop" procedure group and the catheter ablation control group, but the "one-stop" procedure group had a higher early recurrence rate. It shows that the addition of left atrial appendage occlusion on the basis of catheter ablation does not affect the success rate of atrial fibrillation ablation. This study showed that the MLHFQ scores (MLHFQ score) was decreased in the 1-year follow-up of the "one-stop" procedure patients, and the cardiac function was significantly improved compared with that before the operation. After the implantation of the LAA occluder, the pressure in the left atrium increases, which affects the return of the pulmonary veins, and the left atrial appendage is excluded from the blood circulation, which interferes with the filling of the left ventricle (Coisne et al., 2017; Phan et al., 2019; Wintgens et al., 2018), while atrial fibrillation Ablation plays a diametrically opposite role (Luani et al., 2017). Several studies (Yagishita et al., 2017; Zhu, 2020) found that the cardiac function of patients undergoing "one-stop" procedure was significantly improved compared with that before surgery, indicating that the effect of atrial fibrillation ablation in improving cardiac function was stronger than that of LAAC on cardiac function, indicating that "one-stop" procedure can improve the patient's cardiac function. A study compared the improvement of LVEF and left atrial diameter after atrial fibrillation ablation was better than that of the "one-stop" procedure group. This may be related to the impact of occluder implantation on the mechanical function of the left atrium. In sinus rhythm, the left atrial appendage undergoes two filling and emptying processes in one cardiac cycle, which reduces the volume load of the left atrium and also plays a role in assisting the filling of the left ventricle. The implantation of the left atrial appendage occluder interfering with this effect leads to an increase in left atrial diameter and a change in LVEF.

The purpose of this article is to investigate the difference in the prognosis of patients with atrial fibrillation by taking different intervention measures, and to provide a basis for the selection of clinical strategies. In this study, four groups of patients with different interventions were followed up for 1 year to compare their prognostic indicators. We found that patients with atrial fibrillation who received radiofrequency ablation or "one-stop" procedure for 1 year had significantly improved quality of life, cardiac function, and a lower incidence of adverse events, and the radiofrequency ablation group was better than the "one-stop" procedure group. One year after LAA closure, the quality of life and cardiac function decreased, and the incidence of adverse events increased.

There are many shortcomings in this study. First, the sample size is small, the follow-up time is short, and there may be data bias, and more cases need to be selected and observed. Second, the patients in the LAAC group were mostly patients with recurrence after radiofrequency ablation, the effect of radiofrequency ablation was poor, and the burden of atrial fibrillation was large, which may have a selection bias. Third, long-term prognosis requires longer follow-up. Further research is needed.

In conclusion, compared with drug treatment, radiofrequency ablation and "one-stop" procedure can improve the quality of life of patients with atrial fibrillation, improve cardiac function, and reduce adverse events. Percutaneous left atrial appendage occlusion affects the quality of life of patients and improves cardiac function, and increases the incidence of adverse events.

AUTHOR CONTRIBUTIONS

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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CONFLICT OF INTEREST

The authors declare that they have no competing interests.

DATA AVAILABILITY STATEMENT

All data generated or analyzed during this study are included in this published article.

ETHICS STATEMENT

This study was conducted in accordance with the Declaration of Helsinki. This study was conducted with approval from the Ethics

Committee of Xinhua (Chongming) Hospital Affiliated to Shanghai Jiaotong University School of Medicine. Written informed consent was obtained from all participants.

CONSENT FOR PUBLICATION

The manuscript is not submitted for publication or consideration elsewhere.

REFERENCES

Abdin, A., Yalin, K., Lyan, E., Sawan, N., Liosis, S., Meyer-Saraei, R., Elsner, C., Lange, S. A., Heeger, C. H., Eitel, C., Eitel, I., & Tilz, R. R. (2019). Safety and efficacy of cryoballoon ablation for the treatment of atrial fibrillation in elderly patients. *Clinical Research in Cardiology*, *108*(2), 167–174. https://doi.org/10.1007/s00392-018-1336-x

Bahnson, T. D., Giczewska, A., Mark, D. B., Russo, A. M., Monahan, K. H., al-Khalidi, H. R., Silverstein, A. P., Poole, J. E., Lee, K. L., Packer, D. L., & CABANA Investigators. (2022). Association between age and outcomes of catheter ablation versus medical therapy for atrial fibrillation: Results from the CABANA trial. *Circulation*, *145*(11), 796–804. https://doi.org/10.1161/CIRCULATIONAHA.121.055297

Brachmann, J., Sohns, C., Andresen, D., Siebels, J., Sehner, S., Boersma, L., Merkely, B., Pokushalov, E., Sanders, P., Schunkert, H., Bänsch, D., Dagher, L., Zhao, Y., Mahnkopf, C., Wegscheider, K., & Marrouche, N. F. (2021). Atrial fibrillation burden and clinical outcomes in heart failure: The CASTLE-AF trial. *JACC Clinical Electrophysiology*, *7*(5), 594–603. https://doi.org/10.1016/j.jacep.2020.11.021

Calkins, H., Hindricks, G., Cappato, R., Kim, Y. H., Saad, E. B., Aguinaga, L., Akar, J. G., Badhwar, V., Brugada, J., Camm, J., Chen, P. S., Chen, S. A., Chung, M. K., Nielsen, J. C., Curtis, A. B., Davies, D. W., Day, J. D., d'Avila, A., de Groot, N. M. S. (. N.)., … Yamane, T. (2017). 2017 HRS/EHRA/ECAS/APHRS/SOLAECE expert consensus statement on catheter and surgical ablation of atrial fibrillation. *Heart Rhythm*, *14*(10), e275–e444. https://doi.org/10.1016/j.hrthm.2017.05.012

Chen, M., Sun, J., Wang, Q. S., Zhang, P. P., Li, W., Zhang, R., Mo, B. F., Yu, Y. C., Cai, X., Yang, M., Lian, X. M., Zhao, Y., Gong, C., Yu, Y., Liu, B., Feng, X., Lu, Q., & Li, Y. G. (2022). Long-term outcome of combined catheter ablation and left atrial appendage closure in atrial fibrillation patients. *International Journal of Cardiology*, *368*, 41–48. https://doi.org/10.1016/j.ijcard.2022.08.007

Coisne, A., Pilato, R., Brigadeau, F., Klug, D., Marquie, C., Souissi, Z., Richardson, M., Mouton, S., Polge, A. S., Lancellotti, P., Lacroix, D., & Montaigne, D. (2017). Percutaneous left atrial appendage closure improves left atrial mechanical function through frank-Starling mechanism. *Heart Rhythm*, *14*(5), 710–716. https://doi.org/10.1016/j.hrthm.2017.01.042

Cruz-González, I., Ince, H., Kische, S., Schmitz, T., Schmidt, B., Gori, T., Foley, D., de Potter, T., Tschishow, W., Vireca, E., Stein, K., & Boersma, L. V. (2020). Left atrial appendage occlusion in patients older than 85 years. Safety and efficacy in the EWOLUTION registry. *Revista Española de Cardiología (English Edition)*, *73*(1), 21–27. https://doi.org/10.1016/j.rec.2019.02.008

Ding, W. Y., Gupta, D., & Lip, G. (2020). Atrial fibrillation and the prothrombotic state: Revisiting Virchow's triad in 2020. *Heart*, *106*, 1463–1468.

Dognin, N., Salaun, E., Champagne, C., Domain, G., O'Hara, G., Philippon, F., Faroux, L., Beaudoin, J., O'Connor, K., Bernier, M., Rodés-Cabau, J., Champagne, J., & Champagne, J. (2022). Percutaneous left atrial appendage closure in patients with primary hemostasis disorders and atrial fibrillation. *Journal of Interventional Cardiac Electrophysiology*, *64*(2), 497–509. https://doi.org/10.1007/s10840-021-01073-0

Falasconi, G., Gaspardone, C., Godino, C., Gaspardone, A., Radinovic, A., Pannone, L., et al. (2021). Left atrial appendage closure: A new strategy for cardioembolic events despite oral anticoagulation. *Panminerva Medica*. https://doi.org/10.23736/S0031-0808.21.04446-3. [Online ahead of print].

Glikson, M., Wolff, R., Hindricks, G., Mandrola, J., Camm, A. J., Lip, G. Y. H., Fauchier, L., Betts, T. R., Lewalter, T., Saw, J., Tzikas, A., Sternik, L., Nietlispach, F., Berti, S., Sievert, H., Bertog, S., & Meier, B. (2020). EHRA/EAPCI expert consensus statement on catheter-based left atrial appendage occlusion–an update. *EuroIntervention*, *15*(13), 1133–1180. https://doi.org/10.4244/EIJY19M08_01

Go, A. S., Reynolds, K., Yang, J., Gupta, N., Lenane, J., Sung, S. H., Harrison, T. N., Liu, T. I., & Solomon, M. D. (2018). Association of Burden of atrial fibrillation with risk of ischemic stroke in adults with paroxysmal atrial fibrillation: The KP-RHYTHM study. *JAMA Cardiology*, *3*(7), 601–608. https://doi.org/10.1001/jamacardio.2018.1176

Gupta, D., Vijgen, J., Potter, T., Scherr, D., Van Herendael, H., Knecht, S., et al. (2021). Quality of life and healthcare utilisation improvements after atrial fibrillation ablation. *Heart*, *107*(16), 1296–1302. https://doi.org/10.1136/heartjnl-2020-318676

Hunter, R. J., Berriman, T. J., Diab, I., Kamdar, R., Richmond, L., Baker, V., Goromonzi, F., Sawhney, V., Duncan, E., Page, S. P., Ullah, W., Unsworth, B., Mayet, J., Dhinoja, M., Earley, M. J., Sporton, S., & Schilling, R. J. (2014). A randomized controlled trial of catheter ablation versus medical treatment of atrial fibrillation in heart failure (the CAMTAF trial). *Circulation. Arrhythmia and Electrophysiology*, *7*(1), 31–38. https://doi.org/10.1161/CIRCEP.113.000806

Kany, S., Brachmann, J., Lewalter, T., Akin, I., Sievert, H., Zeymer, U., Ledwoch, J., Ince, H., Thomas, D., Hochadel, M., Senges, J., Kirchhof, P., & Rillig, A. (2022). Impact of atrial fibrillation pattern on outcomes after left atrial appendage closure: Lessons from the prospective LAARGE registry. *Clinical Research in Cardiology*, *111*(5), 511–521. https://doi.org/10.1007/s00392-021-01874-3

Kelly, J. P., DeVore, A. D., Wu, J., Hammill, B. G., Sharma, A., Cooper, L. B., Piccini, J. P., Allen, L. A., Heidenreich, P. A., Peterson, E. D., Yancy, C. W., Fonarow, G. C., Hernandez, A. F., & Hernandez, A. F. (2019). Rhythm control versus rate control in patients with atrial fibrillation and heart failure with preserved ejection fraction: Insights from get with the guidelines-heart failure. *Journal of the American Heart Association*, *8*(24), e011560. https://doi.org/10.1161/JAHA.118.011560

Luani, B., Groscheck, T., Genz, C., Tanev, I., Rauwolf, T., Herold, J., Medunjanin, S., Schmeisser, A., & Braun-Dullaeus, R. C. (2017). Left atrial enlargement and clinical considerations in patients with or without a residual interatrial shunt after closure of the left atrial appendage with the WATCHMAN™-device. *BMC Cardiovascular Disorders*, *17*(1), 294–302.

Marrouche, N. F., Brachmann, J., Andresen, D., Siebels, J., Boersma, L., Jordaens, L., Merkely, B., Pokushalov, E., Sanders, P., Proff, J., Schunkert, H., Christ, H., Vogt, J., & Bänsch, D. (2018). Catheter ablation for atrial fibrillation with heart failure. *The New England Journal of Medicine*, *378*(5), 417–427. https://doi.org/10.1056/NEJMoa1707855

Mo, B. F., Lian, X. M., & Li, Y. G. (2022). Current evidence on the safety and efficacy of combined atrial fibrillation ablation and left atrial appendage closure. *Current Opinion in Cardiology*, *37*(1), 74–79. https://doi.org/10.1097/HCO.0000000000000913

Mohrez, Y., Gloekler, S., Schnupp, S., Allakkis, W., Liu, X. X., Fuerholz, M., Brachmann, J., Windecker, S., Achenbach, S., Meier, B., & Kleinecke, C. (2021). Clinical benefit of left atrial appendage closure in octogenarians. *Journal of Geriatric Cardiology*, *18*(11), 886–896. https://doi.org/10.11909/j.issn.1671-5411.2021.11.003

Osmancik, P., Herman, D., Neuzil, P., Hala, P., Taborsky, M., Kala, P., Poloczek, M., Stasek, J., Haman, L., Branny, M., Chovancik, J., Cervinka, P., Holy, J., Kovarnik, T., Zemanek, D., Havranek, S., Vancura, V., Peichl, P., Tousek, P., … PRAGUE-17 Trial Investigators. (2022). 4-year outcomes after left atrial appendage closure versus nonwarfarin Oral anticoagulation for atrial fibrillation. *Journal*

of the American College of Cardiology, *79*(1), 1–14. https://doi.org/10.1016/j.jacc.2021.10.023

Phan, Q. T., Shin, S. Y., Cho, I. S., Lee, W. S., Won, H., Sharmin, S., Lee, D. Y., Kim, T. H., Kim, C. J., & Kim, S. W. (2019). Impact of left atrial appendage closure on cardiac functional and structural remodeling: A difference-in-difference analysis of propensity score matched samples. *Cardiology Journal*, *26*(5), 519–528. https://doi.org/10.5603/CJ.a2018.0047

Romanov, A., Pokushalov, E., Artemenko, S., Yakubov, A., Stenin, I., Kretov, E., Krestianinov, O., Grazhdankin, I., Risteski, D., Karaskov, A., & Steinberg, J. S. (2015). Does left atrial appendage closure improve the success of pulmonary vein isolation? Results of a randomized clinical trial. *Journal of Interventional Cardiac Electrophysiology*, *44*(1), 9–16. https://doi.org/10.1007/s10840-015-0030-4

Saad, M., Osman, M., Hasan-Ali, H., Abdel Ghany, M., Alsherif, M. A., Risha, O., Sano, M., Fink, T., Heeger, C. H., Vogler, J., Sciacca, V., Eitel, C., Stiermaier, T., Joost, A., Keelani, A., Fuernau, G., Saraei, R., Kuck, K. H., Eitel, I., & Tilz, R. R. (2022). Atrial appendage closure in patients with heart failure and atrial fibrillation: Industry-independent single-Centre study. *ESC Heart Fail*, *9*(1), 648–655. https://doi.org/10.1002/ehf2.13698

Samuel, M., Khairy, P., Champagne, J., Deyell, M. W., Macle, L., Leong-Sit, P., Novak, P., Badra-Verdu, M., Sapp, J., Tardif, J. C., & Andrade, J. G. (2021). Association of atrial fibrillation burden with health-related quality of life after atrial fibrillation ablation: Substudy of the cryoballoon vs contact-force atrial fibrillation ablation (CIRCA-DOSE) randomized clinical trial. *JAMA Cardiology*, *6*(11), 1324–1328. https://doi.org/10.1001/jamacardio.2021.3063

Takeda, K., Tsuboko, Y., & Iwasaki, K. (2022). Latest outcomes of transcatheter left atrial appendage closure devices and direct oral anticoagulant therapy in patients with atrial fibrillation over the past 5 years: A systematic review and meta-analysis. *Cardiovascular Intervention and Therapeutics*, *37*(4), 725–738. https://doi.org/10.1007/s12928-022-00839-1

Turagam, M. K., Lavu, M., Afzal, M. R., Vuddanda, V., Jazayeri, M. A., Parikh, V., Atkins, D., Bommana, S., di Biase, L., Horton, R., Bai, R., Swarup, V., Cheng, J., Natale, A., & Lakkireddy, D. (2017). Catheter ablation for atrial fibrillation in patients with Watchman left atrial appendage occlusion device: Results from a multicenter registry. *Journal of Cardiovascular Electrophysiology*, *28*(2), 139–146. https://doi.org/10.1111/jce.13148

Wang, H., Du, X., Guo, L., Guo, X., Chen, Y., Xia, S., Chang, S., Pan, J., Dong, J., & Ma, C. S. (2019). Ablation versus medical therapy for atrial fibrillation in the elderly: A propensity score-matched comparison. *Medical Science Monitor*, *25*, 9875–9881. https://doi.org/10.12659/MSM.917755

Wang, Y., Wu, D., Ma, J., Liu, X., Zhang, H., So, C. Y., Lam, Y. Y., Wang, B., Wang, J., Zhang, H., Wang, M., Song, G., & Wu, Y. (2021). The feasibility and safety of "one-stop" left atrial appendage closure and percutaneous coronary intervention in atrial fibrillation patients with significant coronary artery disease (PCI-LAAC study). *American Journal of Cardiovascular Disease*, *11*(5), 679–687.

Wintgens, L., Romanov, A., Phillips, K., Ballesteros, G., Swaans, M., Folkeringa, R., Garcia-Bolao, I., Pokushalov, E., & Boersma, L. (2018). Combined atrial fibrillation ablation and left atrial appendage closure: Long-term follow-up from a large multicentre registry. *Europace*, *20*(11), 1783–1789. https://doi.org/10.1093/europace/euy025

Xu, Y., Cai, H., & Li, H. S. (2022). Comparison of the efficacy of radiofrequency ablation and drug therapy in patients with atrial fibrillation and heart failure. *Advances in Cardiovascular Diseases*, *43*(3), 274–281. https://doi.org/10.16806/j.cnki.issn.1004-3934.2022.03.021

Yagishita, A., Yamauchi, Y., Sato, H., Yamashita, S., Hirao, T., Miyamoto, T., Hirao, K., & Isobe, M. (2017). Improvement in the quality of life and exercise performance in relation to the plasma B-type natriuretic peptide level after catheter ablation in patients with asymptomatic persistent atrial fibrillation. *Circulation Journal*, *81*(4), 444–449. https://doi.org/10.1253/circj.CJ-16-1123

Yang, J., Liu, Y., Feng, L., Liu, M., You, L., Liu, Y., Wu, J., Zhang, G., Geng, X., & Xie, R. (2021). Effect of left atrial appendage closure in combination with catheter ablation on left atrial function for persistent atrial fibrillation. *Frontiers in Cardiovascular Medicine*, *8*, 666465. https://doi.org/10.3389/fcvm.2021.666465

Zhu, S. (2020). *Effects of left atrial appendage occlusion on adjacent structures, left atrial volume and prognosis of patients with atrial fibrillation [D]*. Southern Medical University.

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