ATRIAL FIBRILLATION AS A PROGNOSTIC FACTOR AFTER BALLOON MITRAL VALVULOPLASTY USING THE INOUE TECHNIQUE: A RETROSPECTIVE ANALYSIS OF LONG-TERM OUTCOMES

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Abstract. *This study presents a comparative analysis of long-term hemodynamic outcomes and survival rates in patients with rheumatic mitral stenosis (MS) who underwent balloon mitral valvuloplasty (BMV) using the Inoue technique, considering the presence of atrial fibrillation (AF) and sinus rhythm (SR). A total of 358 patients were included and divided into AF (n=115) and SR (n=243) groups. Comprehensive assessments of clinical characteristics, echocardiographic parameters, and the incidence of adverse cardiovascular events as well as survival using the Kaplan–Meier method were performed.* ***The results*** *demonstrated that BMV effectively improved hemodynamic parameters in both groups, significantly increasing mitral valve area and reducing the transmitral gradient. However, patients with AF were older, exhibited more pronounced left atrial dilation, and had reduced left ventricular systolic function. Clinical outcomes in this group were less favorable, with higher mortality rates (19.1% vs. 0% in the SR group), increased hospitalizations, and complications. Event-free survival remained stable in the SR group throughout the follow-up period, whereas a significant decline was observed in the AF group. These* ***findings*** *emphasize the importance of early BMV intervention in patients with sinus rhythm to prevent the development of atrial fibrillation and improve prognosis. Patients with AF require prolonged follow-up and a comprehensive therapeutic approach to reduce the risk of adverse outcomes. The results are critical for optimizing the management strategy of rheumatic mitral stenosis, taking into account the arrhythmic status of the patient.*

Keywords: *mitral stenosis, balloon mitral valvuloplasty, atrial fibrillation, sinus rhythm, survival, hemodynamics.*

Introduction. Atrial fibrillation (AF) is a common complication in patients with mitral stenosis (MS). Progressive elevation of pressure in the left atrium leads to structural and electrophysiological remodeling, significantly increasing the risk of AF, particularly in older individuals. This arrhythmia negatively impacts cardiac performance, reduces exercise tolerance, and markedly raises the risk of thromboembolic events [6]. AF substantially worsens the prognosis of the disease and often persists despite surgical or endovascular intervention. Rhythm or rate control is a critical aspect of managing such patients, considering the hemodynamic changes and impaired myocardial contractility.

In the presence of AF associated with MS, warfarin therapy is recommended regardless of the CHA_2DS_2-VASc score, while the efficacy and safety of novel oral anticoagulants (NOACs) in this population remain subjects of ongoing investigation [1]. Balloon mitral valvuloplasty (BMV) is the treatment of choice for patients with critical mitral stenosis; however, its role in preventing AF and maintaining sinus rhythm remains a topic of further research (Fig. 1) [6]. AF is diagnosed in approximately one-third of patients with MS and significantly deteriorates clinical outcomes [3]. Prevention and appropriate management of AF are essential components in developing a treatment strategy, including the selection of pharmacological therapy and the choice between surgical or endovascular approaches.

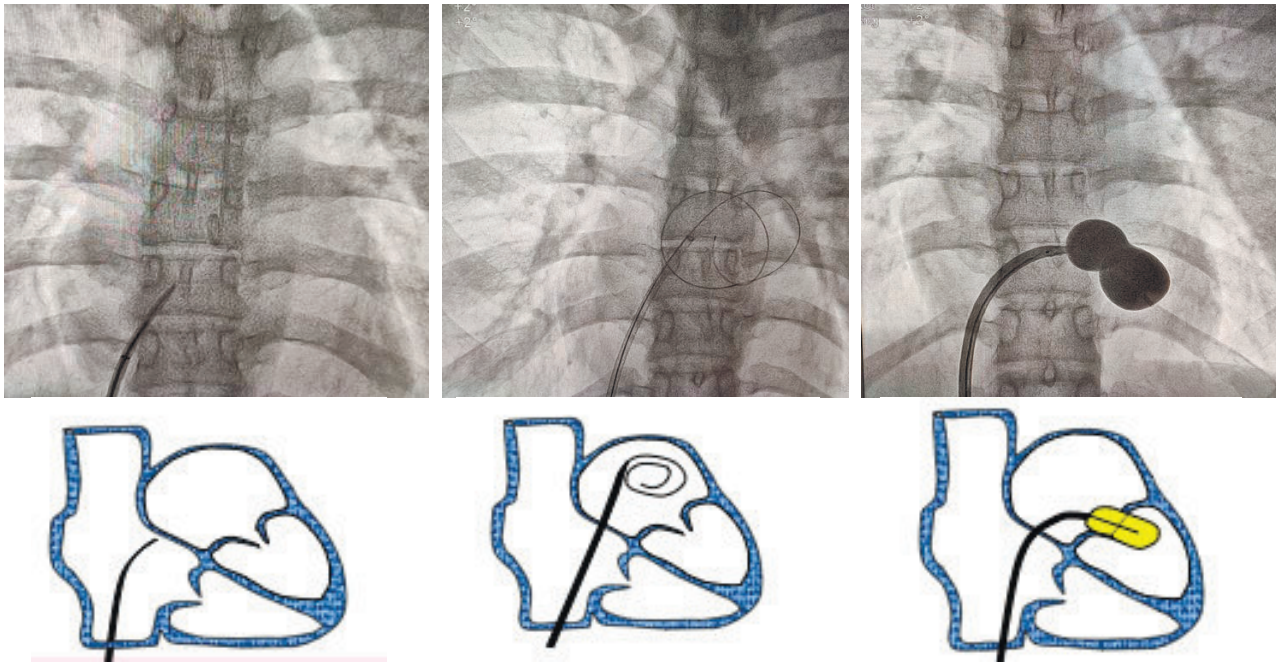

Fig. 1. Main stages of balloon mitral valvuloplasty on fluoroscopic imaging (top row) and schematic illustration (bottom row).

The diagnosis of MS is often initially suspected during physical examination, where findings may include a loud first heart sound, an opening snap of the mitral valve, and a diastolic murmur during ventricular diastole. However, the primary diagnostic modality remains echocardiography (EchoCG). The normal mitral valve area (MVA) ranges from 4 to 6 cm². The severity of stenosis is classified based on MVA as follows: mild (MVA > 2.0 cm²), moderate (MVA 1.0–2.0 cm²), and severe or critical (MVA < 1.0 cm²). A clinically significant stenosis is typically defined as MVA < 1.5 cm².

According to literature data, patients with atrial fibrillation (AF) have significantly worse survival outcomes compared to those in sinus rhythm (SR). The 10-year and 20-year survival rates among patients with AF were 25% and 0%, respectively, whereas patients with SR had survival rates of 47% and 30%, respectively. Mortality rates are associated with advanced age and the presence of heart failure. However, the independent contribution of AF and other comorbid conditions to increased mortality remains unclear [5].

Objective of the study. To perform a comparative analysis of long-term hemodynamic outcomes and survival following Inoue balloon mitral valvuloplasty in patients with atrial fibrillation and sinus rhythm.

Materials and methods. The study included 358 patients who underwent BMV using the Inoue technique between 2014 and 2024 at the Department of Interventional Cardiology, Arrhythmology, and Endovascular Surgery of the Republican Specialized Scientific and Practical Medical Center of Surgery named after Academician V. Vakhidov. All patients had MS of exclusively rheumatic etiology. Indications for interventional treatment of mitral stenosis were determined in accordance with the AHA/ACC Guidelines for the Management of Valvular Heart Disease, based on the relevant version at the time of intervention, with the most recent revision dated 2020. The inclusion criteria were as follows: Rheumatic mitral stenosis; Mitral valve area (MVA) ≤ 1.5 cm²; Absence of mitral regurgitation greater than grade I; Absence of significant mitral valve calcification; Echocardiographic Wilkins score ≤ 8; Age ≥ 18 years; Patient's willingness and ability to comply with the study protocol, including adherence to standard medical therapy.

Patients who did not meet the eligibility criteria for endovascular intervention were excluded from the study. The exclusion criteria included mitral stenosis of non-rheumatic etiology; mitral regurgitation of grade II or higher; significant structural abnormalities of the mitral valve, including

severe calcification or a Wilkins score greater than 8; thrombus in the left atrial appendage; deep vein thrombosis of the lower extremities preventing safe catheter access; a history of surgical correction of an atrial septal defect or the presence of an atrial septal occluder; major congenital cardiac anomalies that would hinder the feasibility of the intervention; and high-grade or unstable angina pectoris.

The primary endpoints for outcome comparison after balloon mitral valvuloplasty included the cumulative incidence of major adverse cardiovascular events (MACEs), such as all-cause mortality, hospitalization due to heart failure, repeat balloon mitral valvuloplasty, mitral valve replacement, and ischemic stroke.

Patients meeting the inclusion criteria were divided into two groups based on baseline cardiac rhythm: those with sinus rhythm (MS-SR, n = 243) and those with atrial fibrillation (MS-AF, n = 115) (Table 1).

Table 1.

Clinical characteristics of patients according to baseline heart rhythm

№	Parameter	SR (n=243)		AF (n=115)		p-value
		abc	%	abc	%	
1.	**Age**					
	11-20	3	1,2	0	0,0	>0,05
	21-30	59	24,3	4	3,5	<0,05
	31-40	74	30,5	13	11,3	<0,05
	41-50	51	21,0	37	32,2	<0,05
	51-60	36	14,8	32	27,8	<0,05
	61-70	19	7,8	22	19,1	<0,05
	≥71	1	0,4	7	6,1	<0,05
2	**Sex**					
	Female	213	87,7	92	80,0	>0,05
	Male	30	12,3	23	20,0	>0,05
3	**MVA (cm^2) (M±m)**	0,97±0,02		1,03±0,02		>0,05
4	**Hypertension**	27	11,1	39	33,9	<0,05
5	**Diabetes mellitus**	4	1,6	9	7,8	<0,05
6	**Stroke**	6	2,5	7	6,1	>0,05
7	**CAD**					>0,05
	FC I	2	0,8	3	2,6	>0,05
	FC II	11	4,5	6	5,2	>0,05
8	**CHF**					>0,05
	FC II	187	77,0	82	71,3	>0,05
	FC III	52	21,4	32	27,8	>0,05
	FC IV	4	1,6	1	0,9	>0,05
9	**CKD**	7	2,9	3	2,6	>0,05
	Pregnancy	38	15,6	1	0,9	<0,05
10	**OMC**	4	1,6	1	0,9	>0,05
11	**CMC**	18	7,4	27	23,5	<0,05
12	**BMV**	5	2,1	11	9,6	<0,05

Abbreviations: *AF – atrial fibrillation; BMV – balloon mitral valvuloplasty; CAD – coronary artery disease; CKD – chronic kidney disease; CMC – closed mitral commissurotomy; CHF – chronic heart failure; OMC – open mitral commissurotomy; MVA – mitral valve area; NYHA – New York Heart Association functional class; SR – sinus rhythm.*

The group of patients with AF was characterized by a statistically significantly older age profile ($p < 0.05$). The proportion of patients over the age of 50 in the AF group was 71.0%, including 19.1% aged 61–70 and 6.1% older than 71 years. In contrast, the sinus rhythm (SR) group predominantly included younger individuals: 55.8% were under 40 years of age (24.3% aged 21–30 and 30.5% aged 31–40), while only 23.0% were over 50 years old ($p < 0.05$). These findings are consistent with the well-established understanding that AF more frequently develops in elderly patients with long-standing disease and advanced structural remodeling of the left atrium.

Females predominated in both groups, which is typical for rheumatic mitral stenosis. In the SR group, women accounted for 87.7%, and in the AF group - 80.0% ($p > 0.05$). Males were more frequent in the AF group (20.0%) than in the SR group (12.3%) ($p > 0.05$). Despite the overall female predominance, the relatively higher proportion of males in the AF group may reflect more severe clinical course and greater predisposition to arrhythmias in the male population.

There were no statistically significant differences in baseline mitral valve area between the groups (SR: 0.97±0.02 cm²; AF: 1.03±0.02 cm²; $p > 0.05$), indicating comparable severity of mitral stenosis at the time of enrollment and confirming that AF is not necessarily associated with a more advanced stage of valvular obstruction.

The prevalence of arterial hypertension was three times higher in the AF group than in the SR group (33.9% vs. 11.1%; $p < 0.05$), confirming its role as a significant risk factor contributing to arrhythmogenesis and worsening heart failure. A similar trend was observed for diabetes mellitus (7.8% in the AF group vs. 1.6% in the SR group; $p < 0.05$) and prior cerebrovascular accidents (6.1% vs. 2.5%; $p > 0.05$), suggesting a more severe comorbid status and elevated vascular risk in the AF group.

The prevalence of ischemic heart disease (IHD) was low in both groups, with no significant difference in functional class (FC I–II; $p > 0.05$), highlighting the dominance of rheumatic pathology and the relatively rare overlap with coronary artery disease in this cohort.

The proportion of patients with chronic heart failure (CHF) of NYHA class III was higher in the AF group (27.8%) than in the SR group (21.4%) ($p > 0.05$), reflecting more pronounced contractile dysfunction and hemodynamic impairment associated with rhythm disturbance and chronic myocardial overload.

The prevalence of chronic kidney disease (CKD) was low and comparable in both groups (2.9% in SR and 2.6% in AF; $p > 0.05$), and thus unlikely to impact outcomes.

Pregnancy was significantly more common in the SR group (15.6% vs. 0.9%; $p < 0.05$), which is attributable to the younger age and better hemodynamic profile in these patients.

The frequency of previous surgical procedures - closed mitral commissurotomy (CMC) and balloon mitral valvuloplasty (BMV) - was significantly higher in the AF group (23.5% and 9.6%, respectively) compared to the SR group (7.4% and 2.1%; $p < 0.05$), which may indicate more severe clinical presentations and a greater need for repeated interventions in patients with AF.

Statistical Analysis Methods. Statistical analysis of the obtained data was performed using both parametric and non-parametric methods. Primary data were systematized using Microsoft Office Excel 2019 (Microsoft, USA) and Statistica 7 for Windows (StatSoft Inc., USA). For the description of quantitative variables, the data were grouped into variation series, followed by calculation of arithmetic means (M), standard deviations (SD), medians (Me), and interquartile ranges (IQR). For the comparison of categorical variables, statistical methods such as Pearson's chi-square test of maximum likelihood with contingency tables, Yates' corrected chi-square test, paired and unpaired Student's t-tests, and Shaffer's method for multiple comparisons were applied. After constructing life tables, descriptive statistics, and Kaplan–Meier cumulative survival estimates, group comparisons of survival functions were carried out using the Gehan–Wilcoxon test.

Results and discussion

Analysis of Hemodynamic Parameter Dynamics Before and After BMV. The mean follow-up period was 56.6 ± 2.1 months (range: 2 to 115 months). As shown in Table 2, both groups demonstrated a significant increase in mitral orifice area (MOA) following BMV. In the SR group, MOA increased from 0.97 ± 0.02 cm² to 1.93 ± 0.03 cm² ($p < 0.001$), while in the atrial fibrillation (AF) group, it rose from 1.02 ± 0.02 cm² to 1.98 ± 0.03 cm² ($p < 0.001$). These results indicate successful correction of mitral stenosis and comparable procedural effectiveness across groups.

The mean TMG in the SR group decreased from 14.6 ± 0.21 mmHg to 3.94 ± 0.22 mmHg ($p < 0.001$), and in the AF group from 17.07 ± 0.3 mmHg to 4.53 ± 0.31 mmHg ($p < 0.001$). Peak TMG values were higher in the AF group (24.82 ± 0.42 mmHg) than in the SR group (22.87 ± 0.3 mmHg), suggesting a greater degree of obstructive flow resistance in AF patients.

Left atrial (LA) pressure significantly decreased in both groups: from 34.74 ± 0.56 mmHg to 12.46 ± 0.37 mmHg in the SR group ($p < 0.001$) and from 32.33 ± 0.78 mmHg to 11.82 ± 0.58 mmHg in the AF group ($p < 0.001$), reflecting a marked reduction in LA afterload post-procedure.

Pulmonary hypertension was also substantially reduced: from 51.46 ± 0.7 to 20.65 ± 0.43 mmHg in the SR group ($p < 0.001$), and from 51.67 ± 1.03 to 20.65 ± 0.53 mmHg in the AF group ($p < 0.001$), confirming the efficacy of BMV in lowering pulmonary artery pressures.

In the SR group, LA diameter decreased significantly from 4.86 ± 0.05 cm to 3.80 ± 0.07 cm ($p < 0.001$), indicating reduced atrial volume and pressure following the intervention. Conversely, in the AF group, the initial LA diameter was significantly larger (5.56 ± 0.1 cm) and showed only minimal reduction to 5.85 ± 0.16 cm at final follow-up ($p < 0.001$), suggesting advanced structural remodeling that is less responsive to hemodynamic unloading.

Patients in the SR group maintained a consistently high left ventricular ejection fraction (LVEF), which remained stable over time (62.76 ± 0.41% at baseline to 60.91 ± 0.6% at final follow-up; $p < 0.01$), reflecting preserved systolic function.

In contrast, patients with AF had a lower baseline LVEF that progressively declined over the follow-up period (from 58.71 ± 0.69% to 52.36 ± 0.96%; $p < 0.001$), indicating worsening myocardial contractility, likely due to persistent rhythm irregularity and chronic volume overload.

End-diastolic volume (EDV) in the SR group increased from 47.26 ± 0.38 mL to 71.39 ± 0.29 mL ($p < 0.001$), and end-systolic volume (ESV) from 17.55 ± 0.23 mL to 27.86 ± 0.42 mL ($p < 0.001$), representing physiological remodeling after stenosis relief with preserved contractile function.

In the AF group, volumetric increases were more pronounced: EDV rose from 47.39 ± 0.57 mL to 75.02 ± 0.42 mL ($p < 0.001$), and ESV from 19.64 ± 0.41 mL to 35.73 ± 0.71 mL ($p < 0.001$). These changes, accompanied by decreased LVEF, suggest progressive deterioration in systolic performance in the AF group.

Table 2.

Comparative Dynamics of Echocardiographic Parameters in Patients with Sinus Rhythm and Atrial Fibrillation

Group	Parameter	Before BMV	IntraoperativeEchoCG	Next day	3 month	Last follow-up
SR (n=243)	EF (%)	62.76 ± 0.41	63.41 ± 0.47 (NS)	63.43 ± 0.49 (NS)	62.33 ± 0.56 (NS)	60.91 ± 0.6**
	EDV (ml)	47.26 ± 0.38	54.08 ± 0.30***	59.64 ± 0.28***	68.74 ± 0.29***	71.39 ± 0.29***
	ESV (ml)	17.55 ± 0.23	19.81 ± 0.28***	21.79 ± 0.30***	25.87 ± 0.18***	27.86 ± 0.42***
	LA diameter (cm)	4.86 ± 0.05	4.86 ± 0.05 (NS)	4.86 ± 0.05 (NS)	4.19 ± 0.06***	3.80 ± 0.07***

	MVA (cm²)	0.97 ± 0.02	1.83 ± 0.02***	1.90 ± 0.02***	1.91 ± 0.02***	1.93 ± 0.03***
	TMG mean (mm Hg)	14.6 ± 0.21	5.17 ± 0.30***	4.94 ± 0.25***	4.60 ± 0.22***	3.94 ± 0.22***
	TMG peak (mm Hg)	22.87 ± 0.30	9.32 ± 0.30***	10.46 ± 0.29***	9.19 ± 0.33***	8.32 ± 0.41***
	LA pressure (mm Hg)	34.74 ± 0.56	19.32 ± 0.37***	16.53 ± 0.34***	14.51 ± 0.34***	12.46 ± 0.37***
	PA pressure (mm Hg)	51.46 ± 0.70	31.26 ± 0.46***	28.42 ± 0.41***	24.06 ± 0.44***	20.65 ± 0.43***
AF (n=115)	**EF (%)**	58.71 ± 0.69	59.16 ± 0.54 (NS)	59.34 ± 0.55 (NS)	56.06 ± 0.81**	52.36 ± 0.96***
	EDV (ml)	47.39 ± 0.57	51.19 ± 0.46***	56.77 ± 0.43***	75.34 ± 0.44***	75.02 ± 0.42***
	ESV (ml)	19.64 ± 0.41	20.93 ± 0.33***	23.08 ± 0.34***	33.16 ± 0.27***	35.73 ± 0.71***
	LA diameter (cm)	5.56 ± 0.10	5.56 ± 0.10 (NS)	5.56 ± 0.10 (NS)	5.74 ± 0.15*	5.85 ± 0.16***
	MVA (cm²)	1.02 ± 0.02	1.80 ± 0.02***	1.87 ± 0.03***	1.94 ± 0.03***	1.98 ± 0.03***
	TMG mean (mm Hg)	17.07 ± 0.30	6.05 ± 0.34***	5.64 ± 0.32***	4.48 ± 0.27***	4.53 ± 0.31***
	TMG peak (mm Hg)	24.82 ± 0.42	10.62 ± 0.41***	9.98 ± 0.40***	8.51 ± 0.52***	8.62 ± 0.58***
	LA pressure (mm Hg)	32.33 ± 0.78	18.93 ± 0.61***	17.18 ± 0.55***	14.37 ± 0.63***	11.82 ± 0.58***
	PA pressure (mm Hg)	51.67 ± 1.03	32.20 ± 0.65***	29.21 ± 0.58***	24.39 ± 0.65***	20.65 ± 0.53***

*NS – non sighnificant ($p > 0.05$), * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Abbreviations: EDV – End-Diastolic Volume; EF – Ejection Fraction; ESV – End-Systolic Volume; LA diameter – Left Atrial Diameter; LA pressure – Left Atrial Pressure; MVA – Mitral Valve Area; PA pressure – Pulmonary Artery Pressure; TMG mean – Mean Transmitral Gradient; TMG peak – Peak Transmitral Gradient.*

Analysis of Clinical Events and Survival at Median Follow-up in Patients Undergoing BMV Depending on Baseline Cardiac Rhythm.

A comparative evaluation of the incidence of clinically significant events and overall survival was performed using the Kaplan–Meier method. The follow-up duration averaged 56.6 ± 2.1 months (range: 2 to 115 months). The event-free survival rate was 154 patients (77.8%). The overall survival during the entire follow-up period was 185 patients (93.4%) (Fig. 2). The event-free rates in the SR group (n = 130) and AF group (n = 68) were 115 (88.5%) and 39 (57.4%), respectively. Overall survival in these groups was 130 (100.0%) and 55 (80.9%), respectively (Fig. 3).

To assess composite adverse outcomes, an event-free survival curve was constructed using the Kaplan–Meier method. The composite endpoint included: all-cause mortality, hospitalization due to heart failure, repeat interventions, and stroke (Table 3).

Initially, 358 patients were enrolled in the study and divided into two groups based on baseline rhythm: Group 1 – patients with sinus rhythm who underwent BMV (n = 219), Group 2 – patients with atrial fibrillation who underwent BMV (n = 134). During follow-up, some patients were lost to

follow-up; thus, survival analysis included 189 patients who completed the entire observation period: Group 1 – 121 patients, Group 2 – 75 patients.

Overall mortality was 6.6% (13 patients), and all fatal events occurred exclusively in the AF group (19.1%, n = 13). Mortality in the sinus rhythm group was 0%. The difference between the groups was statistically significant ($p < 0.01$), confirmed by the divergence of Kaplan–Meier curves.

Hospitalization for decompensated chronic heart failure was recorded in 14 patients (7.1%): 5 (3.8%) in the SR group and 9 (13.2%) in the AF group. The difference between groups was statistically significant ($p < 0.05$).

Mitral valve replacement was performed in 4 patients (2.0%): one in the SR group (0.8%) and three in the AF group (4.4%) ($p > 0.05$). Repeat BMV was performed in two patients (1.0%)-both in the SR group. No repeat interventions were recorded in the AF group. The difference was statistically significant ($p < 0.01$).

Stroke occurred in 6 patients (3.0%): 2 (1.5%) in the SR group and 4 (5.9%) in the AF group ($p > 0.05$). New-onset AF occurred in 5 patients, all from the SR group (3.8%), indicating possible progression of electrical instability ($p < 0.01$).

Based on these data, event-free survival in the SR group remained above 90% until 80 months, demonstrating a stable course. In the AF group, a more pronounced and earlier decline in the survival curve was observed, especially within the first 24–36 months of follow-up.

The log-rank test showed significant differences between groups ($p < 0.01$), indicating the negative prognostic impact of atrial fibrillation.

The overall survival curve also showed a marked divergence between groups: no deaths occurred in the SR subgroup, while in the AF group, overall survival began to decline in the early months of follow-up, dropping to below 70% by month 100. The intergroup difference in all-cause mortality was statistically significant ($p < 0.01$).

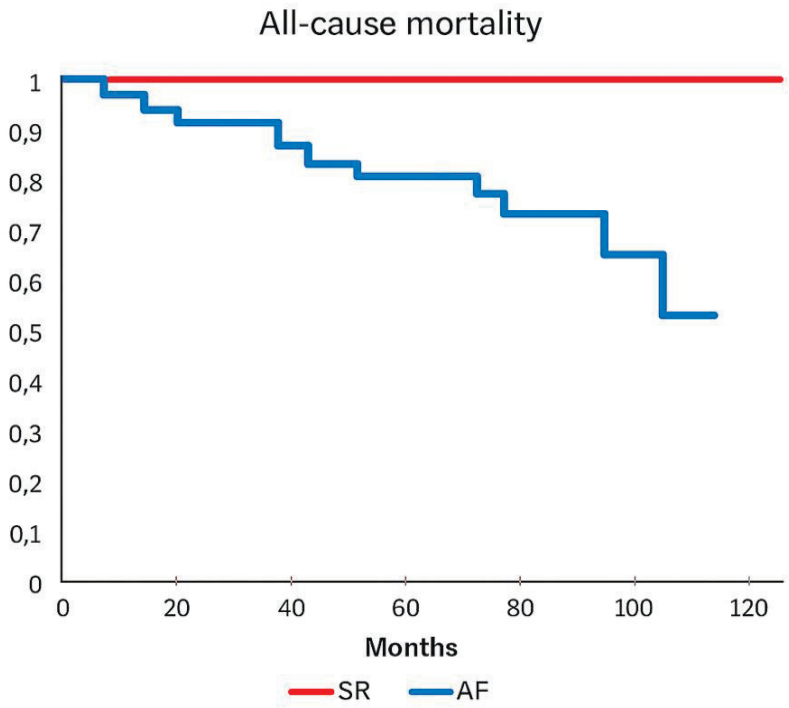

Fig. 2. Kaplan–Meier curves of all-cause mortality after successful BMV in two groups. Clinical events were defined as all-cause mortality, hospitalization due to heart failure, repeat BMV, mitral valve replacement, and stroke. BMV – balloon mitral valvuloplasty; MV – mitral valve; HF – heart failure.

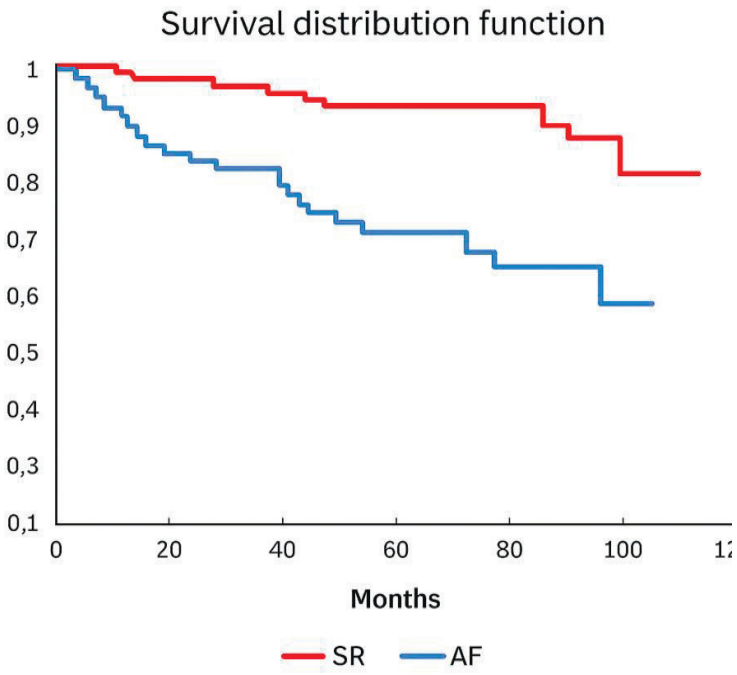

Fig. 3. Kaplan–Meier curves of event-free survival after successful BMV in two groups. Clinical events were defined as all-cause mortality, hospitalization due to heart failure, repeat BMV, mitral valve replacement, and stroke. BMV – balloon mitral valvuloplasty; MV – mitral valve; HF – heart failure.

Table 3.

Documented clinical events at median follow-up

Clinical events	All patients (n=189)	Sinus rhythm (n=130)	Atrial fibrillation (n=59)	p
All-cause-mortality	13 (6.6%)	0 (0.0%)	13 (19.1%)	<0.01
Hospitalization due to heart failure	14 (7.1%)	5 (3.8%)	9 (13.2%)	<0.05
Mitral valve replacement	4 (2.0%)	1 (0.8%)	3 (4.4%)	>0.05
Re-BMV	2 (1.0%)	2 (1.5%)	0 (0.0%)	<0.01
Stroke	6 (3.0%)	2 (1.5%)	4 (5.9%)	>0.05
Atrial fibrillation	5 (2.5%)	5 (3.8%)	0 (0.0%)	<0.01

Note: *Statistically significant differences were observed between the study groups ($\chi^2 = 45.348$, *p* < 0.01).*

Discussion. The issue of AF and its impact on the clinical course of patients with MS remains relevant and requires further investigation. According to the literature, the incidence of AF in patients with MS is approximately 40% [5]. AF resulting from rheumatic MS differs pathophysiologically from AF of non-rheumatic origin. Age is a predominant factor in the development of AF, and LA enlargement may be the consequence of longstanding AF rather than its primary cause. Moreover, the severity of MS is not always directly related to the frequency of AF development [2], which supports our findings: there were no statistically significant differences in MVA and TMG between the two groups both at baseline and after successful BMV.

In a study dedicated to the impact of LA diameter-supporting our findings-it was demonstrated that LA diameter is an independent predictor of adverse cardiovascular events [4]. Patients with

critical complicated MS are significantly more likely to be associated with higher NYHA functional class and increased incidence of adverse clinical outcomes. Low cardiac output may be linked to more severe symptoms and reduced exercise tolerance in patients with MS and AF compared to those with MS and SR.

Early BMV should be considered in patients with SR and moderate MS with minimal symptoms, in contrast to a watchful waiting approach that risks symptom progression or the development of new-onset AF [7].

Patients with AF were associated with worse symptomatology and a higher rate of adverse events after successful BMV compared to patients with SR. Individuals with AF should be closely monitored over the long-term following successful BMV. Furthermore, appropriate management of patients with AF after BMV is a critical component of therapy, aiming to alleviate symptoms and improve both immediate and long-term clinical outcomes.

In summary, the above findings emphasize the need for continued research into interventional treatment approaches for patients with AF and MS. Only through further investigation can optimal therapeutic strategies be developed to improve outcomes in this patient population.

Conclusions. Patients with AF due to rheumatic mitral stenosis are characterized by older age, more pronounced left atrial dilatation, and reduced ejection fraction compared to those with SR. BMV effectively improves hemodynamic parameters in both groups; however, clinical outcomes are poorer in AF patients, with higher mortality and hospitalization rates. The absence of significant differences in mitral valve area and transmitral gradient confirms comparable severity of valvular pathology at the time of enrollment. Early BMV in patients with SR may help prevent the onset of AF and improve long-term prognosis. Patients with AF require prolonged follow-up and a comprehensive management approach to reduce the risk of adverse outcomes.

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