ECHOCARDIOGRAPHIC PREDICTORS OF LEFT ATRIAL APPENDAGE THROMBUS IN PATIENTS WITH ATRIAL FIBRILLATION

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INTRODUCTION

Cardiovascular diseases, particularly atrial fibrillation (AF), pose a substantial burden on global health, contributing significantly to morbidity and mortality rates. Among the complications associated with AF, thromboembolic events, particularly strokes, stand out as a major concern.

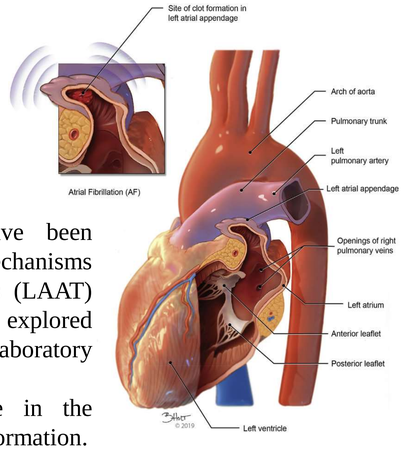

Fig 1. Thrombus formation in the left atrial appendage

In recent years, significant efforts have been dedicated to understanding the complex mechanisms underlying left atrial appendage thrombus (LAAT) formation (Fig. 1). Numerous studies have explored various clinical, echocardiographic, and laboratory parameters as potential predictors .

Echocardiography remains a cornerstone in the assessment of LAA function and thrombus formation.

AIM OF THE STUDY

To evaluate echocardiographic parameters associated with LAAT formation in patients with non-valvular AF.

MATERIALS AND METHODS

Patients with persistent non-valvular AF admitted for direct electrical cardioversion (N=100)

Group 1. Patients with LAAT (N=30)

Group 2. Patients without LAAT (N=70)

Exclusion criteria:

- chronic rheumatic heart disease;
- valvular pathology of the heart requiring surgical correction;
- prosthetic heart valves ;
- recent acute myocardial infarction, coronary artery bypass grafting, or coronary angioplasty (less than 3 months before enrollment in the study;
- oncological diseases and severe concomitant extracardiac pathology.

All patients underwent clinical, laboratory, and instrumental studies, including transthoracic echocardiography (TTE) and transesophageal echocardiography (TEE).

TTE was performed on Phillips iE33 device with a multi-frequency sensor (frequency 2.5-5.0 MHz). The examination was performed with the patient lying on his left side with his back to the researcher.

TEE was performed using Phillips iE33 device by an experienced echo cardiologist to assess for the presence of LAAT. The LAA was imaged in multiple views to identify thrombus (Fig. 2).

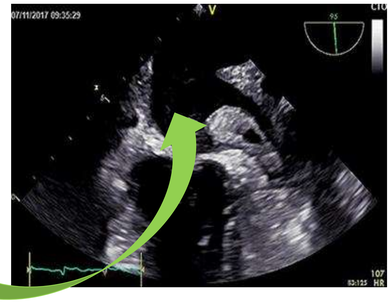

Fig 2. Transesophageal echocardiogram showing the large left atrial thrombus.

RESULTS

- Patients in both groups were comparable in age (63.6 [58; 69] vs 61.3 [54; 68], p=0.166) and gender (male sex 66.7% vs 60%, p=0.591).
- There were no significant intergroup differences in the prevalence of hypertension, coronary artery disease, obesity, hyperlipidemia, prior stroke, and diabetes mellitus (p>0.05).
- Patients with LAAT had a higher prevalence of prior MI (10% vs 2.8%, p=0.01), renal impairment (mean eGFR 71.2 [54; 84] vs 90.0 [64; 103], p=0.015), and heart failure with reduced LVEF (40% vs 7.2%, p<0.001).

Table 1. Echocardiographic parameters of patients (Me [25%;75%])

Parameter	LAAT (n=30)	Non LAAT (n=70)	p
LA diameter, mm	46.8 [43; 50]	44.2 [41; 46]	0.060
LA area, mm2	30.1 [27; 33]	27.2 [24; 30]	0.004
LA volume, ml	74.6 [61; 85]	63.8 [52; 72]	0.066
LAVI, ml/m2	37.6 [31; 42]	30 [24; 36]	0.007
RA diameter, mm	43.1 [41; 45]	41.1 [39; 44]	0.019
RA area, mm2	26.7 [23; 30]	23.8 [21; 27]	0.007
LVEF, %	49.2 [44; 60]	57.4 [55; 62]	0.019
LVMMI, g/m2	147.4 [119; 164]	121.3 [99; 136]	0.003
RWT, mm	0.45 [0.40; 0.50]	0.45 [0.40; 0.48]	0.662

- According to the results of TTE, patients didn't have significant differences in left atrial diameter (p=0.060) and left atrial volume (p=0.056). However, LAVI was higher in patients with LAAT (p=0.007) as well as LA area (p=0.004). Moreover patients with LAAT had lower left ventricular ejection fraction (LVEF) (p=0.019) and higher RA diameter (p=0.019) and area (p=0.007).
- When conducting a one-way ROC analysis, threshold values of echocardiographic parameters associated with the development of LAAT were identified (Table 2).

Table 2. Results of one-way ROC analysis

Parameter	Threshold value	AUC	CI 95%	Se, %	Sp, %	p
LA area, mm2	27.9	0.682	0.563 – 0.802	73.3	62.8	0.019
LAVI, ml/m2	30.0	0.680	0.561 – 0.800	76.7	52.8	0.020
RA diameter, mm	41	0.649	0.526 – 0.771	**83.3**	41.2	0.047
RA area, mm2	29.9	0.670	0.552 – 0.792	36.7	**91.4**	0.025
LVEF, %	51	**0.701**	**0.584 – 0.819**	53.3	85.7	**0.011**
LVMMI, g/m2	135.8	0.687	0.568 – 0.806	56.7	74.3	0.016

Abbreviations: AUC – area under the curve; CI – confidence interval; Se – sensitivity; Sp – specificity.

- LVEF ≤51% demonstrated the largest area under the ROC-curve (0.701) of all studied electrocardiographic parameters, as well as pretty high specificity (85.7%).
- RA diameter ≥41 mm had the highest sensitivity among all the studied parameters (83.3%), but the lowest specificity (41.2%).
- On the contrary RA area ≥29.9 mm2 showed the highest specificity (91.4%), but the lowest sensitivity (36.7%).

CONCLUSION

- Patients with LAAT and non-valvular AF had greater values of LAVI (p=0.007), LA area (p=0.004) and RA area (p=0.007), as well as lower LVEF (p=0.019) compared with patients without LAAT.
- The most informative echocardiographic predictor of LAAT in non-valvular AF is the value of LVEF ≤51%, which demonstrated high sensitivity of 53.3% and specificity 85.7%, as well as a pretty high area under the ROC curve (0.701).

- **Conflict of interest is not stated. Source of founding – none.**