Transesophageal echocardiography before atrial fibrillation ablation: to do or not to do?

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Related article
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Transcatheter ablation (TCA) of atrial fibrillation (AF) has achieved significant goals in recent years, allowing stable sinus rhythm in the majority of patients treated, regardless of the energy sources (thermal or nonthermal) used for rhythm control [1]. Such results would have not probably been achieved without advanced echocardiographic imaging, which has evolved from transthoracic to transesophageal echocardiography (TEE), together with computed tomography, magnetic resonance, up to three-dimensional digital reconstruction of the left atrium (LA) and pulmonary veins (PVs) by electroanatomic mapping. LA mechanical function recovery, sinus rhythm restoration, and embolic stroke prevention are the main considerations when a given patient is scheduled for TCA of the arrhythmic substrate. Recent guidelines support the concept that in patients with AF, the detection of an intracardiac thrombus, mostly located in the LA appendage (LAA), should lead to the cancellation of planned cardioversion (ECV) or TCA, and the initiation of therapeutic anticoagulation in anticoagulant-naive patients [2]. In the current issue of the *Polish Heart Journal*, Kaufmann and coworkers [3] critically consider the use of TEE in patients undergoing TCA for AF or atrial flutter; based on multiple echocardiographic parameters, including left ventricular ejection fraction >65%, LA diameter <40 mm, LA area <20 cm^2, LA volume <113 ml, and LA volume index <51 ml/m^2, they demonstrated 100% sensitivity and 100% negative predictive value for the absence of LA thrombosis in 417 patients. Additional echocardiographic indices that combined the above elucidated parameters excluded LA thrombus in over one-third of the study participants with 100% sensitivity and a 100% negative predictive value, without using TEE. Overall, the authors demonstrated that simple echocardiographic parameters could help identify individuals for whom TEE could be safely omitted before scheduled for elective TCA due to AF and atrial flutter [3]. Previous reports have variably investigated bio-humoral features, such as cardiac troponin I, C-reactive protein, B-type natriuretic peptide, D-dimer, uric acid, creatinine seric levels [4–7], as well as multiple serial parameters including activated partial thromboplastin time, hematocrit, hemoglobin level, international normalized ratio, platelet count, and white blood cell count [8]. Additional reports focused on clinical assessments, like age >75 years, diabetes mellitus, arterial hypertension, valvular heart diseases, prior stroke or transient ischemic attack, and cardiomyopathy [9] which reinforced the role of the CHA_2DS_2-VASc score. The most updated data derive from uninterrupted use of direct oral anticoagulants (DOACs) [10], and from the LATTEE registry which evaluated together several predicting factors like age, AF type, sinus rhythm during TEE, heart failure, diabetes, systemic connective tissue disease, chronic obstructive pulmonary disease, previous CHA_2DS_2-VASc score, and prevalence of DOACs [11].

In summary, TEE is a valuable tool in the field of cardiac electrophysiology, with three main clinical applications: i) transeptal puncture for LA catheterization; ii) LA thrombus exclusion before ECV; iii) LAA thrombus exclusion before transcatheter closure of the LAA (LAAC) (Figure 1). While the "less inva-

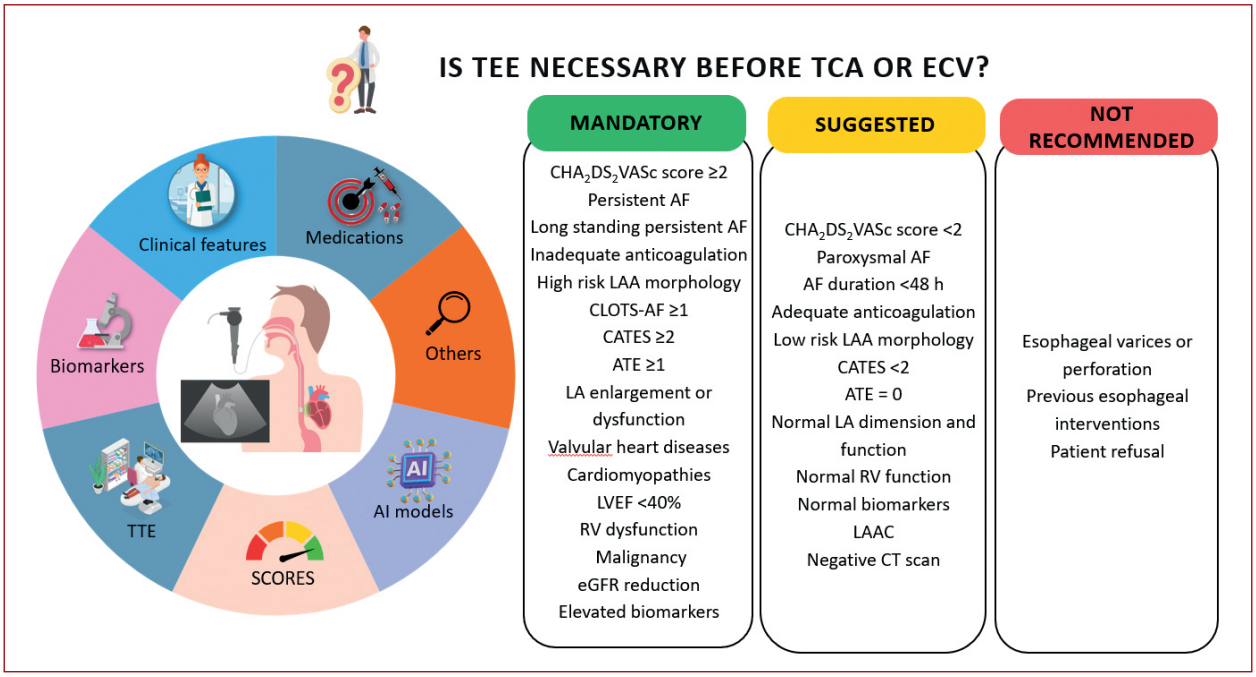

Figure 1. Indications and contraindications for transesophageal echocardiography in the management of atrial fibrillation. The left circle represents categories for treatment guidance. Vertical rectangles indicate feasible scenarios (green label), controversial areas (yellow label), and exclusion criteria (red label)

Abbreviations: AF, atrial fibrillation; AI, artificial intelligence; ATE, atrial thrombus exclusion score (*ref#7*); CATES, score (*ref#6*) that includes C-reactive protein, atrial volume, troponin I and C, episode duration, stroke or embolism; CLOTS-AF: score (*ref#5*) that includes creatinine >1.5 mg/dl, left ventricular ejection fraction <50%, overload LA volume index >34 ml/m^2, tricuspid annular plane systolic excursion <17 mm, stroke; CT, computed tomography; ECV, electrical cardioversion; eGFR, estimated glomerular filtration rate; LA, left atrium; LAA, left atrial appendage; LAAC, left atrial appendage closure; LVEF, left ventricular ejection fraction; RV, right ventricle; TCA, transcatheter ablation; TEE, transesophageal echocardiogram; TTE, transthoracic echocardiogram

sive" approach represented by ECV may be safely omitted when the patient is strictly following oral anticoagulation regimens, either assuming the DOACs continuously or vitamin K antagonists for obtaining the right therapeutic range along several checks (the so-called time therapeutic range higher than 70%), the question as to whether to rule out TEE when TCA of AF is planned remains a matter of debate. The advent of improved materials and technology in high-volume, experienced hospital centers has enabled the performance of transeptal puncture through the adoption of X-ray anatomical points in real time. Conversely, the actual exclusion of periprocedural LAA thrombus has prompted the implementation of numerous trials suggesting ablation under no interruption or minimal interruption of the DOACs [1, 2, 10]. It is unfortunate that periprocedural TEE with or without uninterrupted DOACs does not warrant stroke-free procedures in all cases. It is possible that atrial cardiomyopathy, which develops when AF is not treated adequately, is responsible for loss of atrial contraction and transport function [12], which can be translated in increased risk of stroke in a few cases, while others might experience cognitive decline and dementia [13, 14]. However, the sub-analysis of the LATTEE registry indicates that a comprehensive assessment of AF clinical cases prior to TCA can contribute to a reduction in stroke risk, particularly when oral anticoagulation is ongoing and the CHA_2DS_2-VASc score is low [3, 8, 11, 15]. In light of the aforementioned considerations, we concur with the prevailing perspective, which may be reinforced by cardiac computed tomography, particularly with a delayed contrast-enhanced image acquisition protocol. This approach has emerged as an alternative imaging modality for the exclusion of intracardiac thrombus, as well as for cardiac magnetic resonance imaging. It is noteworthy that catheter-based intracardiac ultrasound can be employed for both transeptal puncture and LAA thrombus exclusion. Moreover, it offers the additional benefit of PVs visualization, which can facilitate wall contact and reduce the risk of transmural lesions, thereby improving the likelihood of AF-free survival in the majority of studies [1, 2]. It is therefore imperative that ablation procedures be standardized. Currently, there is a significant degree of practice variation in the approach to treating AF, with some clinicians opting for an invasive first-line therapy and others performing repeated procedures. To better define standards of care for this therapeutic choice, large registries and more data are required. Despite the lack of evidence demonstrating efficacy, numerous interventions, such as the addition of ablation lines in the LA, are still performed. Conversely, the optimal approaches to persistent AF and repeat ablation remain poorly defined. It may be the case that TEE exclusion should be reserved for selected candidates for ablation. It

is therefore recommended that cardiologists and electrophysiologists should endeavour to identify clinical markers that will enable them to establish when TCA is unlikely to benefit patients and to define specific criteria for candidacy for first-time and repeat procedures. In the near future, artificial intelligence may be employed to better tailor therapy to the individual patient, taking into consideration numerous factors that may better select candidates for therapeutic approaches. These factors include anticoagulation versus LAA occlusion, rhythm versus rate control, TCA versus medical therapy, modification of risk factors, genetics, and others. It is hoped that artificial intelligence will be implemented not only for the assessment of TEE requirements, but also for the management of AF.

Article information

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