Periprocedural stroke and atrial fibrillation ablation: to do transoesophageal echocardiography, or not to do transoesophageal echocardiography, that is the question

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This editorial refers to ‘Impact of routine transoesophageal echocardiography on safety, outcomes, and cost of pulmonary vein ablation: inferences drawn from a decision analysis model’ by L.J. Gula et al., on page 1550 and ‘Transoesophageal echocardiography predictors of periprocedural cerebrovascular accident in patients undergoing catheter ablation of atrial fibrillation’ by K. Chilukuri et al., on page 1543

Several complications may occur during or shortly after atrial fibrillation (AF) ablation. Some of them are relatively common, such as cardiac tamponade, but rarely have significant clinical consequences if managed adequately. Others are less common, such as stroke, but may lead to disabling sequelae. This has prompted the wide use of procedures and practices aimed at the reduction of cerebrovascular complications, such as high anticoagulation levels during the procedure or transoesophageal echocardiography (TEE) prior to ablation. However, neither the net clinical benefit nor the cost-effectiveness of these practices has been adequately validated. This should be considered relevant since some of these may themselves be associated with complications, limit the workflow of the ablation laboratory or increase costs. Two interesting papers in this issue of the Journal address the potential role of routine TEE prior to AF ablation.

Pre-existent left atrial appendage thrombus and risk of embolization during atrial fibrillation ablation

The paper by Chilukuri et al. assessed the potential TEE predictors of periprocedural stroke during AF ablation, other than the left atrium (LA) thrombus. This is important since the majority of studies exploring the use of TEE prior to AF ablation have focused on the detection of LA thrombi, which is an imaging rather than a clinically relevant endpoint. The risk of embolization associated with catheter manipulation within LA in patients with LA appendage thrombi detected prior to AF ablation is unknown but is considered very high. However, catheter manipulation within LA in patients with LA thrombi does not always result in a cerebrovascular accident. Some investigators found that around 10% of patients (24 out of 232) develop thrombi of significant size (on average, 12.9 × 2.2 mm, range 3–40 mm) which were detected by intracardiac echocardiography (ICE) during AF ablation. None of these patients developed clinical thromboembolism despite the fact that most of the thrombi were attached to the ablation catheter or the transeptal sheath. Consequently, some seemingly obvious clinical extrapolations may be incorrect. An example of such an extrapolation is the once commonly accepted matching the number of shocks in patients with implantable cardioverter-defibrillators with the number of lives saved by the device. Thus, the presence of LA thrombi may not always end in systemic embolization during LA catheter manipulation and systemic embolization does not always have significant clinical consequences. This is also supported by studies which have found that both the risk of stroke and the need for TEE are virtually abolished in patients undergoing AF ablation who continued anticoagulation with warfarin during the entire periprocedural period. This finding suggests that avoiding fresh thrombus formation by adequate anticoagulation is more relevant than trying to detect LA appendage thrombi of undetermined age by TEE.

Chilukuri et al. found that TEE parameters did not predict the periprocedural cerebrovascular accident, even when spontaneous echocontrast was included into analysis. The latter has been
found predictive of stroke following electrical cardioversion in several studies. However, it should be acknowledged that many patients had not been properly anticoagulated at the time of TEE in these studies, which is just the opposite to what occurs when TEE is performed prior to AF ablation. This again emphasizes the importance of proper and stable anticoagulation and invalidates the raw extrapolation of the conclusions of earlier cardioversion studies on the ablation setting.

Transoesophageal echocardiography cost-effectiveness

The low prevalence of LA thrombi in patients chronically anticoagulated, the development of new imaging techniques, and cost constraints have questioned the use of TEE in all patients prior to AF ablation. The paper by Gula et al. in this issue of the Journal reports Markov analysis based on established and speculative data, such as the risk of stroke due to catheter manipulation within LA in patients with LA thrombi detected on TEE. Although this may be considered a limitation, the authors suggested that including the different speculative values in analysis affected their results very little. They have concluded that routine TEE use prior to AF ablation may detect LA thrombi and prevent stroke in some patients with a significant increment in cost [incremental cost-effectiveness ratio of $226 608 per quality adjusted life year (QALY)]. However, the calculated incremental cost-effectiveness ratio was much lower for high-risk patients ($2232 per QALY). Costs at $30 000–50 000 per QALY are generally accepted as the limit for a procedure to be cost-effective. Thus, routine TEE in all patients prior to AF ablation is probably unnecessary and should be restricted to high-risk patients, such as those with left ventricular dysfunction, previous embolic events, or a high CHADS2 score.14–6

Transoesophageal echocardiography vs. other diagnostic techniques

The common practice of performing a computer tomography (CT) scan prior to AF ablation has raised the question if this can replace TEE for LA thrombus detection. Some have questioned this because CT may produce false positive results and because some thrombus predictors, such as spontaneous echocoontrast, are not easily seen on CT. However, high sensitivity and negative predictive value reported by others render TEE unnecessary except in patients with positive or unclear findings on the CT scan. In addition, the paper by Chilukuri et al. questions the importance of detecting spontaneous echocoontrast for embolic prevention. Nevertheless, TEE should possibly be used instead of CT in repeat procedures to reduce radiation risks.

Recent reports suggested that ICE can replace TEE for LA appendage thrombus detection.9 This may have a significant impact because ICE is routinely used during AF ablation in many centres. In addition to pre-existent LA thrombus, ICE may also detect recently formed thrombi or those which develop during the procedure. Finally, other advantages of ICE include guiding the transseptal puncture, monitoring pericardial effusion (something that may allow increasing the anticoagulation level without the fear of late detection of this complication), direct visualization of catheters within the cardiac structures, and air bubble formation detection. The drawbacks of this technique are that pre-existent thrombi will only be detected once the vascular access is obtained and increased costs. Therefore, a controlled trial or cost-effectiveness analysis, like the one performed by Gula et al. for TEE, is needed to establish the proper role of ICE vs. TEE in AF ablation.

Conclusions

Periprocedural stroke prevention during AF ablation is challenging. Transoesophageal echocardiography is probably not warranted if the patient undergoes pre-procedural CT or ICE during the procedure. In addition, the cost-effectiveness ratio is too high to recommend TEE routinely in patients with a CHADS2 score <2 who are in sinus rhythm or are properly anticoagulated. Finally, the role of TEE in patients with arrhythmias other than AF following AF ablation is unclear.

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References