Atrial fibrillation (AF) significantly increases the risk of left atrial (LA) thrombus and systemic thromboembolism.\(^1\)\(^-\)\(^4\) Screening transesophageal echo (TEE) to rule out left atrial thrombus has become standard of care over the years.\(^5\) Conventional thinking of therapeutic anticoagulation for 4-6 weeks prior to cardioversion may not reduce the risk of left atrial thrombus completely. Left atrial thrombi can be seen on 2-9% of screening TEEs in AF patients with various levels of anticoagulation.\(^5\) Radiofrequency ablation of atria with pulmonary vein isolation (PVI) with or without various ablational techniques has evolved into very important strategy in the treatment of patients with AF.\(^6\)\(^-\)\(^10\) Even though the relative risk of systemic thromboembolism after non TEE guided cardioversion after 3 weeks of anticoagulation remains lower (approximately 0.8%) despite 7% prevalence of LA thrombi, the same may not be applicable to invasive treatment modalities like AF ablation.\(^5\)\(^,\)\(^11\)\(^-\)\(^13\) The presence of LA thrombi may increase the risk of clot dislodgment and subsequent thromboembolism with catheter manipulation during AF ablation and is considered to be an absolute contraindication.

In this issue of JAFIB, de Bono et al try to assess the risk of LA thrombi prior to AF ablation.\(^14\) It was a retrospective study that looked at 244 pre-procedural TEEs in 148 consecutive patients who underwent AF ablation at their institution. After therapeutic INRs for 4 weeks and warfarin holding 3 days prior the ablation, 4 out of the 244 screening TEEs showed LAA thrombus at 1.6%.

Two out of the four patients met the criteria for high thrombogenic risk with depressed LV function, persistent AF, severely dilated LA, prior transient ischemic attacks. However, the other two had paroxysmal AF with CHADS\(^2\) score less than or equal to 1 and a high AF burden. Based on their low risk profile the latter two patients would not have been bridged with low molecular weight heparin (LMWH) or heparinoids by conventional wisdom. This is a very small study with intriguing findings. It raises an important question if every patient should undergo preprocedural screening to rule out left atrial thrombus.

There are three vulnerable time periods that increase the risk of periprocedural thromboembolism:
during AF ablation. Preprocedurally, persistence of LA thrombi despite conventional anticoagulation or formation of a new thrombus during the warfarin free interval prior to the ablation, if undetected can add to the risk of thromboembolism. Intraprocedurally, thrombus formation on the transseptal sheaths and catheters and coagulum formation at the ablation site due to protein denaturation can result in thromboembolism. Post procedurally, endothelial denudation and extensive left atrial ablation and LAA stunning from conversion to sinus rhythm can promote thrombus formation.

Even though the incidence of clots in patients without the thrombogenic risk factors is low (1.1%) it is still not zero.\textsuperscript{14, 15} It raises the possibility of clot dislodgement as the cause of systemic thromboembolism in at least some of these patients periprocedurally. In our ongoing efforts to make AF ablation safer, attention should be paid to this period of warfarin free interval where there is small but real risk of thrombus formation.

Pre ablation CT scans are usually obtained for assessing the LA and pulmonary venous anatomy, integration with 3D electroanatomic mapping and as a baseline for assessing the progression of PV stenosis. These CTs also provide valuable information about the status of LA thrombus. From a registry of 1221 patients from the Cleveland Clinic’s AF ablation program, 9 patients had findings suggestive of LAA thrombus on preablation CT scan but only 3 of them were confirmed by a TEE.\textsuperscript{16} All of the 3 patients had predisposing factors that increased their risk of thrombus formation including – chronic AF and low left ventricular ejection fraction. No thrombus was seen in patients with paroxysmal AF and normal LVEF.

Recently, Patel et al have shown that LAA/ascending aorta Hounsfield Unit (HU) cut off ≤ 0.75 on the preablation CTs correlate to LAA thrombus and dense non clearing spontaneous echo contrast (SEC) with high sensitivity (100%) and moderate specificity (72%).\textsuperscript{17} CTs also have a low positive predictive value (29%) with a very high negative predictive value (100%). So in patients who undergo preablation CTs, a LAA/Ascending aorta HU ratio > 0.75 may preclude the need for preprocedural TEE suggestive of the absence of a LAA thrombus. Unless these CTs are done within 24 hours of the ablation, the brief hiatus of no warfarin period before ablation can still continue to be a challenge with propensity to clot formation. This can be addressed by performing ablation on therapeutic INRs avoiding the warfarin free period prior to the ablation.

Wazni et al reported the superiority of uninterrupted anticoagulation with warfarin in decreasing the risk thromboembolism without increasing the risk of bleeding compared to full dose and half dose subcutaneous LMWH bridging after stopping warfarin prior to ablation.\textsuperscript{18} But one has to be cautious in interpreting these results as this experience is limited to a very high volume tertiary care center with operators on the higher end of the learning curve and those patients with paroxysmal AF. Replication of similar results in other groups of patients in low volume institutions with operators on lower half of the learning curve can answer a lot of questions that surround the periprocedural anticoagulation.

On the other side of the coin, there are anecdotal reports of very long and tortuous LAAs in which thrombus may not be detected on TEEs due to portions of the LAA being out of plane. CT scans may perform better in detecting thrombus in these oddly shaped LAAs.\textsuperscript{19} In this issue of JAFIB, a featured review article by Mears et al highlights the current state of anticoagulation and bleeding related issues in a very comprehensive fashion.\textsuperscript{20}

In the absence of significant risk factors it is still hard to justify a preablation TEE in every patient from a cost effectiveness and patient comfort stand point. The risk of atrial stunning and propensity to thrombus formation in patients who have a very high daily burden of paroxysmal AF may be similar to those with persistent AF. Anticoagulation strategy in this subset of paroxysmal AF patients should be on the same lines as those of persistent AF. Efforts should be made to utilize the preablation CT data to effectively screen patients. To conclude this study does make a good point for the possibility of LAA thrombus in unsuspecting cases of paroxysmal AF. However, the overall incidence of thrombus is much lower than the prior reported series, especially in those who are deemed to be low risk. The presence of high
AF burden should be considered as a risk factor for higher thrombogenicity. The subset of patients with paroxysmal AF and well preserved LVEF, low to moderate AF burden and non severely dilated LA need to be further studied before any definitive recommendations can be made on the need for routine preablation screening TEE.

References

2. Ryder KM, Benjamin EJ. Epidemiology and significance of atrial fibrillation. Am J Cardiol 1999;84:131R-8R.