

More Bubble, More Trouble?

Insights into Microembolic Events During Left Atrial Ablation

See Article by Miyazaki et al

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Recently, it was demonstrated that freedom from paroxysmal atrial fibrillation can be achieved by cryoballoon guided pulmonary vein isolation as effectively as by radiofrequency guided ablation.¹ Moreover, repeat cardioversions and hospitalizations were significantly reduced after cryoballoon treatment.² As a result, cryoballoon guided pulmonary vein isolation is increasingly used rapidly approaching 300 000 procedures worldwide (source: Medtronic).

Although cryoballoon has shown favorable procedural outcomes in terms of stroke, it remains a devastating complication related to left atrial ablation. One of the most important steps toward reduced stroke/transient ischemic attack rates was to implement uninterrupted anticoagulation into management of patients undergoing ablation.^{3,4} However, other factors such as gaseous emboli and tissue debris may also cause embolic events.⁵

To better understand the embolic risk of an individual technology, magnetic resonance imaging has been used to detect silent (ie, asymptomatic) embolic events. Depending on the methods, cryoballoon ablation has been found to be associated with silent embolic events in 4% to 50% of cases, but only little data exists on the second generation cryoballoon.⁶⁻⁸ Although the latter methodology is only capable of assessing the global thromboembolic risk, online visualization of potential emboli by transcranial Doppler imaging may indeed identify the critical steps during an ablation procedure, thus helping to develop preventive strategies.

In the present article by Miyazaki et al,⁹ pulmonary vein isolation procedures using the second generation cryoballoon were meticulously analyzed for embolic sources using real-time transcranial Doppler imaging in 40 patients with paroxysmal atrial fibrillation. In addition, most of these patients underwent pre- and post-procedural magnetic resonance imaging to detect silent embolic events.

Owing to the sophisticated design of the experiment the authors provide deep insight into the most critical parts of cryoballoon ablation. The procedure was sliced into 9 stages, thereby identifying catheter insertion and balloon deflation after the first energy application as the dominant sources for microembolic signals (MES).

The latter may not entirely be avoided by preinflation because it seems to be associated with microbubbles (and maybe solid ice particles) entrapped in the ice cap that are released during the thawing phase. Thus, one would need to freeze and thaw the cryoballoon before introducing it into the left atrium, rather than solely inflating it.

Catheter removal and reinsertion, however, should be strongly discouraged. And, certainly the balloon should be used with custom made circular mapping catheter (Achieve) obviating the need for inserting any other catheter into the left atrium.

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Both findings underscore the importance of careful deairing management during left atrial procedures using large bore transseptal sheaths. Actions to consider include the use of high-flow sheath flush to avoid pushing air beyond the hemostatic valve, the introduction of catheters with the sheath submerged in a water bath, aspiration of air bubbles with a syringe after having introduced the catheter to the distal end of the sheath.

The present study⁹ also contributes to the discussion whether MES detection by transcranial Doppler may truly allow to estimate the embolic risk. In other words, is MES associated with any detectable cerebral lesions or any neurological symptoms? In the present article, no association was found and is therefore well in line with previous reports.¹⁰ Others, however, have observed a clear association between MES and magnetic resonance imaging detected cerebral lesions¹¹ and more importantly, between MES and a subtle cognitive decline after the ablation procedure.¹²

Indeed, we need to acknowledge that we still miss a piece of the puzzle, although the study elucidated important procedural caveats.

From a clinical perspective, it is striking that cryoballoon ablation is associated with fewer ischemic events as compared with duty-cycled radiofrequency ablation¹³ and at the same time studies using transcranial Doppler confirmed these findings on the level of MES.¹⁴

Apparently, not every bubble cause trouble but simple procedural maneuvers may help to further reduce iatrogenic emboli that are potentially harmful.

AFFILIATION

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DISCLOSURES

None.

FOOTNOTES

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