While diseased regions of the atrial body commonly behave as a substrate maintaining atrial fibrillation (AF), these areas can uncommonly behave as trigger foci for atrial tachycardia (AT), particularly after previous ablation. Unlike venous triggers, the goal of ablation for these focal ATs is normally elimination of the tachycardia source, rather than complete isolation. We present a case of a difficult to ablate post–AF-ablation AT from the anterior left atrium (LA), in which sinus rhythm was restored by incarcerating the ongoing AT within a small, isolated region of LA myocardium.

Case Reports
A 67-year-old man who underwent pulmonary vein isolation, electrogram-based LA ablation, and roof, left mitral and cavotricuspid isthmus ablation for permanent AF in 2002 and repeat ablation of recurrent paroxysmal AF in 2009 (details unavailable), was referred for a third ablation procedure for rate-controlled incessant AT (Figure 1A). Figure 1B shows intracardiac recordings on decapolar catheter in the coronary sinus and 3.5-mm externally irrigated tip ablation catheter in the LA during baseline AT (cycle length, 308 ms). Activation and entrainment mapping established the diagnosis of focal source AT arising from the ostium of the left atrial appendage (LAA) where ablation led to cycle length variation of >25% (range, 276 to 402 ms) – unstable AT (Figure 1C). Focal ablation at another site with substantial temporal gradient between the proximal and distal bipoles of the ablation catheter in the anterior LA restored sinus rhythm (Figure 1D). However, unstable AT continued inside the LAA, suggesting a possible source within the now inadvertently isolated LAA (Figure 2A) with base to apex activation on the decapolar catheter positioned in the LAA. Further ablation at LAA base resulted in local slowing, but the tachycardia was not eliminated. At conventional electrogram gains, there was no electric activity on bipole 9-10 lying against the anterior LA wall outside the LAA ostium. After we increased the gain, we discovered ongoing clinical tachycardia at 308 ms on bipole 9-10 (Figure 2B). Before this discovery, ablation around the LAA base led to LAA slowing because of multiple level of blocks between the tachycardia source and LAA, as demonstrated by 2:1 conduction (CL616ms) to the LAA ostium and 4:1 conduction to the LAA apex (CL1232ms) (Figure 2B). This revealed that the LAA, which was mapped and ablated as an AT source, was, in fact, a bystander. Further ablation of this arrhythmia, which was incarcerated into a small anterior LA region lying against bipole 9-10, was withheld and the procedure was terminated.

Discussion
This case provides examples of 3 unusual electrophysiological phenomena: (1) isolation, not termination, of arrhythmogenic substrate harboring a focal source AT; (2) beat-to-beat variation in the global AT cycle length without any variation at the source level; and (3) a single AT with distinct exits to the LA and the isolated LAA.

Atrial substrate is often a source (anterior LA, posterior LA, septum) of microreentrant ATs post-AF ablation. Irrespective of the mechanism of arrhythmogenesis, substrate-related sources are normally amenable to focal ablation and substrate isolation is not necessary. In the patient described above, very-low-voltage anterior LA substrate harboring stable, focal source, clinical AT likely because of microreentry was inadvertently isolated during ablation, targeting the earliest activation sites that eventually turned out to be tachycardia exits (Figure 3). Thus, whereas sinus rhythm was restored in most of the biatrial chamber, tachycardia continued within an isolated region of the anterior LA. Multiple procedures and widespread LA ablation, undertaken previously, predisposed this patient to isolation of a portion of
atrial substrate with 2 spot radiofrequency applications during this procedure. The focus of tachycardia could be intramyocardial or more epicardial, based on the persistence of arrhythmia at the source, especially because the source is located at a relatively thick anterior left atrial area near the base of the appendage.

At baseline, global AT cycle length was stable. After first radiofrequency lesion (site 1 in Figure 3), beat-to-beat variation in the global AT cycle length was observed. However, the tachycardia was very stable at the source. Variation in global cycle length but not at the source suggested a beat-to-beat change in the atrial breakthrough site. Also, the global atrial activation pattern, as assessed from the activation of coronary sinus, showed no change compared with stable AT. Absence of variation in the global activation pattern in the presence of different tachycardia exit sites suggests that the breakthroughs must have been located relatively close to each other (Figure 3).

Electric isolation of the LAA is an uncommon, but recognized consequence of catheter ablation of AF. A recent case series highlights the fact that, in extensively ablated or diseased atria, LAA isolation can occur during ablation at anatomically distant sites. Careful postprocedure analysis of the electrograms in this case revealed that LAA isolation likely occurred with the first lesion at the LAA ostium.
indicating tenuous conduction at study outset because of prior ablation. Monitoring of LAA conduction during LA ablation in these settings may prevent inadvertent isolation. However, in this case, elimination of the clinical AT would not have been possible without LAA isolation.

Disclosures
None.

References


Figure 3. Schema demonstrating the incarceration of AT in the anterior left atrial source region labeled as “atrial island.” AT source has been displayed as the site of small reentry/focus with multiple breakthroughs. Ablation of breakthrough 1 gave rise to variation in global AT cycle length but not in the source. After the ablation of other breakthroughs (randomly numbered 2, 3, and 4) sinus rhythm was restored elsewhere in the atria. However, AT continued in the island source. It spread centrifugally to the LAA over the persistent connection (white zigzag arrow) of the source with the latter. AT indicates atrial tachycardia; LAA, left atrial appendage.
Restoration of Sinus Rhythm by Incarceration, not Elimination, of Focal Atrial Tachycardia in Left Atrial Substrate Post Atrial Fibrillation Ablation
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