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Influence of complex reentrant atrial circuits on tachycardia cycle length

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Background: Ablation of left atrial reentrant tachycardias (ART) is challenging since they usually occur in the setting of complex diseased atrial tissue either in patients with structural heart disease or after ablation of atrial fibrillation. In these cases, scarred tissue or previous ablation lines make the circuits more complex. We have developed a mapping approach in which an activation map that only contains the active circuit is generated from entrainment maneuvers.

Purpose: To describe the electrophysiological characteristics of the circuits in patients with structural heart disease and previous left atrial ablation.

Methods: Consecutive patients with documented atypical flutter were included. A high density activation map was generated during the index arrhythmia and subsequently, entrainment maneuvers were performed to delineate the active circuit.

Results: Seventeen patients (82% males, average age 62+-7 years, 59% structural heart disease and 53% with a previous left atrial ablation) underwent 20 procedures. Twenty-one circuits were identified (20 in the left atrium and 1 in the right atrium). Of all LA circuits, 15 were macroreentrant (8 roof dependent, 4 perimitral and 3 related to a gap after AF ablation. Four out of 5 microreentrant circuits were related to the left atrial appendage and 1 was identified in the septum. Overall, procedural duration and fluoroscopy time was 176 ± 55 minutes and 27 ± 13 minutes, respectively. Roof-dependent ARTs and gap-related ARTs after AF ablation exhibited a significantly longer TCL (359 ± 99 ms and 331 ± 47 ms, respectively, $p < 0,05$) than perimitral, microreentrant and RA circuits (279 ± 50 ms; 277 ± 36 ms; and 260 ms, respectively). Extensive areas of low voltage (<0.3 mV) were identified in all patients with LA circuits.

Conclusions: The cycle length of complex atrial reentrant tachycardias is apparently related to the location and characteristics of the circuits. This feature can be of help at the time of approaching the mapping and ablation of this tachycardias.