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Is There an Upper Limit of Ablation Index? The Fair Compromise between Safety and Efficacy



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Abstract

Perforation during catheter procedures is relatively uncommon, but potentially fatal if tamponade ensues. This case analyzes the relationship between the occurrence of cardiac perforation during AF Radio Frequency ablation and the Ablation Index (AI), a single index value representing force, contact, time during Pulmonary Vein Isolation (PVI) point-by-point encircling.

Abbreviations: PVI: Pulmonary Vein Isolation; AF: Atrial Fibrillation; RF: Radio Frequency; AI: Ablation Index; FTI: Force-Time Interval

Case Study

Pulmonary Vein Isolation (PVI) is the cornerstone of ablation for paroxysmal and persistent Atrial Fibrillation (AF). Durability of PVs isolation remains the Achilles heel of AF ablation: despite acute isolation, late PV reconnection results in AF recurrences [1]. Radio Frequency (RF) ablation is the most widely used ablation technique. The versatility of this ablation strategy enables operators to tailor the treatment according to anatomical and tissue variability. The Carto Smart Touch™ Technology increases the success rate of Paroxysmal AF procedure with freedom of AF at 1-year follow-up. Recent studies have shown improved clinical outcomes with use of Regional Ablation Index (AI) targets for PVI [2]. Different studies [3-5] have demonstrated > 82% up to 94% success rate. They highlight the minimum AI value for posterior/anterior wall to prevent reconnection. AI value > 400 might result in durable isolation. Sometimes it costs an overshoot observing complications as cardiac perforation. For this reason, all Atrial Fibrillation (AF) procedures performed with Carto® 3 advanced 3D mapping system and a Thermocouple Smart Touch® ablation catheter was analyzed retrospectively. In all cases ablation was done following the conventional linear Force-Time Interval (FTI). For each case AI measurement at each ablation point was estimated retrospectively. In one case a post-procedure complication occurred.

Patient (61 years old) came to our attention for ablation of early persistent AF (Figure 1). Electrophysiological study was performed and PVI using a CF ablation catheter, restoring sinus rhythm. No specific FTI threshold was targeted, while visual gaps (using 3 mm

tags) were avoided. AI was not available to the operators at the time of the procedure. During the day hypotension rose up. Echocardiography suspected signs of hemodynamic instability and pericardial effusion was assessed by CT scan image, without requiring surgical closure. AI values were analyzed off-line and a wide range of AI values appeared, reaching 623 in posterior wall. Of all cases (AI blinded) reviewed it was the only one with cardiac perforation and an AI value > 600 in posterior wall. It suggests AI guided ablation associated with significant reduction in the incidence of acute PV reconnection, but also a more tailored approach to find AI cut-off value avoiding excessive ablation without safety. The integration of Ablation Index into a sequence of standard steps (Workflow) aims to reproduce a successful ablation strategy while standardizing and simplifying AF procedures.

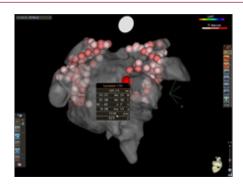


Figure 1: Left atrium atrial fibrillation ablation.

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