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Rotor mapping and ablation; spinning out of control?

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Running title: Rotors out of control?

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Ablation has become an accepted and attractive strategy to treat patients with symptomatic atrial fibrillation (AF)¹⁻². With novel catheter designs and energy sources, trigger driven paroxysmal AF can be treated quite successfully by isolating accessible ectopic sources such as the pulmonary veins (PV), the appendages, and superior vena cava in one or more procedures. However, in patients with non-PAF and more diseased, dilated atria, the results of (multiple) ablation procedures remain disappointing. Different strategies have included stepwise isolation of (potential) foci, applying linear lesions throughout the atria, and elimination of areas with fragmented conduction. The STAR-AF data³ however showed that a standardized approach of progressive stacking of ablation targets does not result in better outcomes for non-PAF. This has led to a revival of the interest in mapping to understand the mechanisms responsible for AF and come up with a tailored ablation approach.

In the past 5 years, the TOPERA system became a fast rising star, offering a tool for continuous real-time mapping of both atria during AF. Electrograms recorded by a 64-pole basket catheter are analyzed by proprietary software to identify focal and/or recurring electrical activity in a circular pattern called rotor, offering a target for so-called FIRM ablation. Astonishing single center registry data were shown at every AF meeting by one of the company's founders Dr. Narayan, with rotors around the PV, septum and roof easily and reproducibly mapped and ablated in just a few minutes, resulting in termination or slowing of AF in 86% of cases, with twice the success rate (88% vs 44% freedom of AF at follow-up) compared to only conventional PVI ablation⁴. Initial multicenter registry data followed, apparently confirming feasibility and long-term efficacy (81% freedom of AF) of a PVI+FIRM guided ablation approach in small numbers of selected patients in selected centers⁵. In the current issue of the Heart Rhythm Journal, Steinberg et al.⁶ paint a different picture with their initial single center experience with FIRM-guided ablation in addition to (re-)isolation of the PVs. In 43 pts AF termination or organization to slower rhythms succeeded in only 5% of cases, and during an 18 mo follow-up only 21% were free from AF recurrence while only 12% were also free from anti-arrhythmic drugs.

What should we think of this initial experience of a single center that started using TOPERA after commercialization of the system started? Is it lack of skills or training, inexperience, wrong strategy, patient selection, random error, bad luck, or are there more fundamental problems that play a role here? Obviously there is a learning curve involved with the use of any new tool, but the group of Steinberg and colleagues had already participated in the initial studies⁵ that suggested even centers new to the system should be able to achieve over 80% long-term success even in their first pts. Comparing the data to Narayan et al.⁴ and Miller et al.⁵ it seems the number of rotors identified and ablated was slightly lower (median 1.8 vs. 2.1 vs 2.3), while the distribution of rotors seemed random and differed between all studies. Similar proportions of 75% with non-paroxysmal AF were treated, so the poor results do not

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