

# Novel noncontact charge density map in the setting of post-atrial fibrillation atrial tachycardias: first experience with the Acutus SuperMap Algorithm

Ramak, et al. J Interv Card Electrophysiol. 2020; DOI: doi.org/10.1007/s10840-020-00808-9

## Background

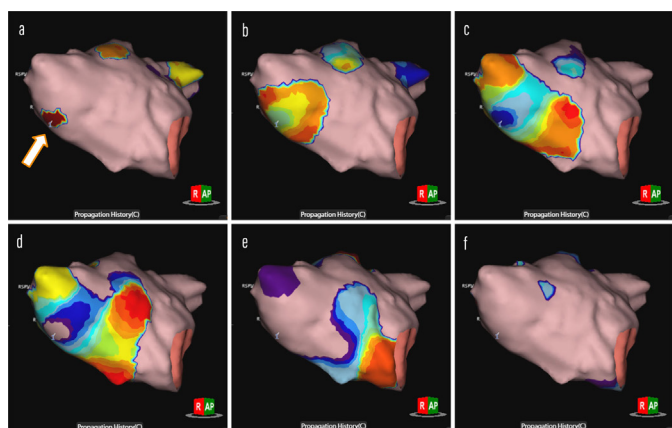
Atrial tachycardias (AT) can be observed following ablation of atrial fibrillation (AF) in 5–25% of cases. AT ablation remains arduous as it can be time-consuming especially in cases where there are variations of the tachycardia cycle length. The simultaneous and global nature of noncontact mapping may help to understand the mechanisms responsible for initiating and maintaining these arrhythmias.

## Objective and Endpoint

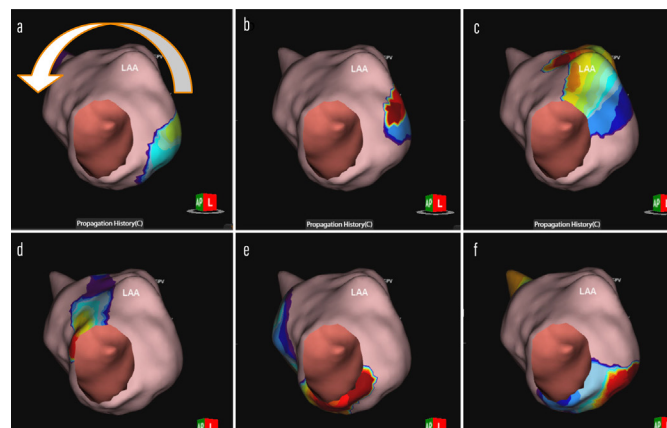
To evaluate the safety and feasibility of the new high-resolution mapping algorithm SuperMap in identifying and guiding ablation in the setting of regular atrial tachycardias following index AF ablation. End point of ablation was the conversion of AT to sinus rhythm and no arrhythmia inducibility following resumption to sinus rhythm.

## Methods

- Seven consecutive patients underwent radiofrequency ablation guided by SuperMap for atrial tachycardia post atrial fibrillation ablation with cryoballoon.
- Mean Age  $67.6 \pm 7.6$ ; 85.7% males.
- All patients had previously failed  $\geq 1$  Class I or III AAD trial following index procedure.
- Two patients exhibited prior history of hybrid thoracoscopic-transcatheter ablation for persistent atrial fibrillation.
- Mean time from index ablation to repeat ablation was  $25.8 \pm 14.4$  months.
- All 28 pulmonary veins were assessed for reconnection and deemed permanently isolated at the time of repeat procedure.



**Fig. 1 Focal AT:** Panels (a), (b), (c), (d), (e), and (f) represent the electrical activation projected on the LA anatomy in different time steps throughout the full CL of the focal AT origination form underneath the RSPV (yellow arrow is starting point). All panels show a RAO view of the LA



**Fig. 2 Mitral isthmus dependent atypical flutter:** Panels (a), (b), (c), (d), (e), and (f) represent the electrical activation projected on the LA anatomy in different time steps throughout the full CL of the counter clockwise mitral isthmus dependent AFL. Yellow arrow is indicating the wave front. All panels show a LAO view of the LA

## Results

- The SuperMap algorithm successfully identified the arrhythmogenic substrate in all 7 patients (100%).
- 3 patients (43%) exhibited focal mechanisms alternating from anteroseptal RSPV, posterior in proximity of LIPV, and interatrial septum in proximity of fossa ovalis, respectively.
- 4 patients (57%) exhibited macroreentrant mechanism.
  - In 3 of these patients, SuperMap detected mitral isthmus-dependent flutters with tachycardia cycle lengths of 240, 270 and 420ms, respectively. A mitral isthmus line was performed connecting the LIPV to the mitral annulus in a posterolateral position.
  - In one patient, the mechanism was a macroreentrant tachycardia with the critical isthmus located between the crista terminalis and atriotomy (epicardial application was needed in the CS in order to terminate the tachycardia).
  - Bidirectional block could be documented in all cases.
- Mean procedural duration time was  $56.4 \pm 12.1$  min.

## Study Limitations

- This study was conducted in a small cohort of patients and is retrospective in nature. Further larger studies are warranted.
- This study was the first to report on a centers experience with the SuperMap algorithm.
- Fluoroscopy times were slightly higher, however this will decrease as experience with this technology increases.

**“...in our opinion, the main advantage of this novel mapping system is that variations in cycle length and CS activation pattern changes do not influence the interpretation of the AT in question. In fact, the algorithm permits to map multiple clusters of arrhythmias and automatically distinguish the beats pertaining to the clinical arrhythmia. This is a strong limitation of sequential mapping with traditional 3Dmapping systems, in which variation of cycle length or small changes in CS activation with the same CL inevitably hampers the accuracy of the map.”**

– Ramak, et al., 2020

## Conclusion

This is the first study describing the feasibility, acute efficacy, and safety of the novel Acutus SuperMap Algorithm in the setting of post AF ablation ATs. The main findings of our first experience are (1) this novel algorithm could identify in all cases the arrhythmic substrate, (2) procedural times were by current standards low, and (3) no minor or major complications occurred. All 28 pulmonary veins were permanently isolated at the time of the repeat procedure. Mean time for anatomy acquisition(s) with the AcQMap system was 2-3min. Mean mapping time(s) for each AT with the SuperMap algorithm 4-6 min. Mean total procedural duration time was  $56.4 \pm 12.1$  min.

### ACUTUS MEDICAL, INC.

2210 Faraday Avenue  
Suite 100  
Carlsbad, CA 92008 USA  
Phone: +1 442-232-6080  
acutus.com

### ACUTUS MEDICAL NV

Ikaroslaan 25  
1930 Zaventem  
Belgium  
Phone: +32 2 669 75 00  
FAX: +32 2 669 75 01

### ABOUT ACUTUS MEDICAL

Acutus Medical is a dynamic arrhythmia care company focused on developing distinct, innovative technologies designed to provide physicians and patients with improved results. Founded in 2011, Acutus Medical, Inc., is based in Carlsbad, California.

**ACUTUS™**  
M E D I C A L

### U.S. Indication for Use:

The AcQMap System is intended for use in patients for whom electrophysiology procedures have been prescribed.

When used with the AcQMap Catheters, the AcQMap System is intended to be used to reconstruct the selected chamber from ultrasound data for purposes of visualizing the chamber anatomy and displaying electrical impulses as either charge density-based or voltage-based maps of complex arrhythmias that may be difficult to identify using conventional mapping systems alone.

AND – When used with the specified Patient Electrodes, the AcQMap System is intended to display the position of AcQMap Catheters and conventional electrophysiology (EP) catheters in the heart.

OR – When used with conventional electrophysiology catheters, the AcQMap System provides information about the electrical activity of the heart and about catheter location during the procedure.

Acutus Medical®, Acutus®, AcQMap®, AcQGuide® and AcQRef® are registered trademarks of Acutus Medical, Inc. Copyright © 2021 Acutus Medical, Inc. All rights reserved. Prior to using these devices please review the Instructions for Use for a complete listing of indications, contraindications, warnings, precautions, potential adverse events and directions for use. AcQMap is CE Marked and FDA cleared. [acutus.com/patents](http://acutus.com/patents)